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THE
AMERICAN JOURNAL OF PHARMACY,

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EDITED BY
JOSEPH CARSON, M. D.
Prof. Mat. Med. in Phil. Coll. Pharm.
AND
ROBERT BRIDGES, M. D.

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THE
AMERICAN JOURNAL
OF
PHARMACY.

APRIL, 1839.

ORIGINAL COMMUNICATIONS.

ART. I.—ON DELPHINIUM CONSOLIDA.

By THOMAS C. HOPKINS.

(An Inaugural Essay.)

THE catalogue of substances, termed vegetable alkaloids, is daily increasing; they are, generally speaking, the principles upon which depends the medicinal activity of the vegetables whence they may be derived; hence, the importance of the labors of the analytic chemist must be apparent to, and appreciated by the physician, as from their results he is enabled to administer a great variety of medicinal agents in an isolated state; thus avoiding the necessity of exhibiting, combined with the active principle, an adventitious bulk of matter, which is not only useless, but, in some cases, very injurious. As a striking proof of the importance of his science, in a medicinal point of view, the organic chemist need only point to the light which his labors have thrown upon the constitution of many agents which are indispensable in medicine, for an instance of which we might mention opium.

But it is not required that, in order to be replete with interest, a newly discovered substance should should be en-

dowed with remedial power; it is enough to ensure it a welcome at the hands of science, that it be possessed of a definite constitution and peculiar properties; of this nature is a vegetable alkaloid discovered by LASSAIGNE and FENEULLE, in the seeds of the *Delphinium stavisagria*, or stavesacre seeds, and called delphia, or delphinia, and the following series of experiments are intended to demonstrate the existence of this principle in a different species of the same genus, the *Delphinium consolida*.

BOTANICAL HISTORY.

The genus *Delphinium* is found under the class Polyandria, and order Trigynia; it belongs to the natural order Ranunculi of JUSSIEU, or Ranunculaceæ of DECANDOLLE and LINDLEY. The fancied resemblance between its flower and the head of the dolphin, has conferred the generic title. The genus is characterized as follows: calyx none, petals five, nectary bifid and horned, pods one or three. It is divided by botanists into nine species, several of which are indigenous to our own country.

Local names.—Larkspur, larksfoot, stagger weed, rocket larkspur. Larkspur is an annual herbaceous plant, usually attaining the height of ten or twelve inches, though it exceeds this in situations favorable to its growth. It has a fibrous, yellowish root, and an erect branching stem, which is somewhat hairy. The leaves are deeply sinuated, so as to give rise to long, linear segments, which are forked at the top; it is this form of the leaf which has originated the popular name of the plant. The flowers are generally of a sky-blue color, and disposed upon the plant in loose, terminal racemes. The peduncles are longer than the bractes, and the nectaries are one-leaved, having an ascending anterior horn, which is about as long as the corolla. The seeds are borne in smooth pods, are irregularly angular, about one line in diameter, of a brown, or blackish-brown color, and have an embossed appearance, owing to minute hairs upon their surfaces, which, when viewed through the microscope, are found to be collected

into distinct ridges or tufts. This species of Delphinium is a native of Europe, but has been introduced into the United States, in some parts of which it has become naturalized, growing rather abundantly in woodlands, in some of the western states.

PROPERTIES.

All parts of the larkspur possess bitter and nauseating properties. The seeds appear to be the portion in which the greatest share of activity resides. These are of an extremely bitter, acrid, and nauseous taste, and yield readily under the pestle, but are with difficulty reduced to an impalpable state, which seems to be in consequence of their containing a large proportion of fixed oil. Paper strewed over with the bruised seeds, quickly becomes saturated, by imbibing it. The flowers come next in acrimony to the seeds. Spirit imbued with their active principles, constitutes a domestic preparation for destroying lice in the hair, for which purpose it is said to be peculiarly efficient. It is also stated, that animals, after having partaken of the plant, become affected in a peculiar manner, to which affection the name of "staggers" has been applied, by those in whose vicinity the plant grows naturally. The juice of the flowers, by inspissation, yields a blue pigment, which, by the intervention of alum, as a mordant, has been used as a dye. It is also stated, that a syrup, colored by this juice, has been criminally vended as syrup of violets.

MEDICAL HISTORY.

The *Delphinium consolida* has been placed in the secondary list of the United States Pharmacopœia, where the root is specified as the officinal portion. This plant, for the most part, has been regarded as presenting but very humble claims to medical observation.

Since all its remedial efficacy is possessed by some other substances, which are at the same time devoid of its objectionable qualities, it has, and no doubt justly, been cast into the shade. Still, like many other substances which have

from time to time uselessly swelled the list of medicinal agents, the larkspur has enjoyed its short period of favor, and the species owes its name to the high repute in which its flowers were held as a vulnerary.

Various parts of the plant have been used medicinally. The flowers were formerly considered diuretic, vermifuge, and emmenagogue, and the seeds, in large doses, are said to produce vomiting and purging. A tincture of the seeds, prepared by macerating an ounce of them in a pint of diluted alcohol, has been employed, both in this country and in England, in spasmodic asthma and dropsy. The dose of this tincture is ten drops. The root is but little, if at all used.

CHEMICAL HISTORY.

No chemical analysis has, as far as I am enabled to ascertain, been made of the plant under consideration, though the seeds of a congener (the *staphisagria*) have undergone investigation, and it was from a supposition that those of the larkspur partook of an analogous constitution, that the annexed experiments were essayed.

1st.—A decoction of the seeds showed a distinct acid reaction, and presented, when filtered, a yellowish-green color. It was of a bitter, nauseous taste, and produced, with the tincture of muriate of iron, a black color, showing the presence of gallic acid. The absence of tannin was shown by their being no change produced by a solution of gelatin. No change in color was produced by tincture of iodine. With a solution of acetate of lead, it afforded a copious flocculent precipitate, of a dirty, white color, which, when collected and dried, presented all the characters of the compound formed by the union of gum and oxide of lead.

2d.—A portion of the seeds were submitted to the action of sulphuric ether for the space of twenty-four hours; the ether soon acquired a greenish color, and, on filtration and evaporation, yielded a fixed oil, which was limpid, of a greenish-yellow color, nearly insipid, and of the specific gravity .90; though, as it possessed some odor, it is but fair to

presume that its specific gravity was somewhat effected by the presence of a volatile oil. In consequence of its green tinge, the presence of chlorophylle was inferred. In order to ascertain whether this oil could be as readily obtained by alcohol, as by ether, two ounces of the bruised seeds were digested in eight ounces of absolute alcohol for two days, at the expiration of which, the alcohol was decanted, and evaporated, when about three drachms of an oil remained, having all the characters of that mentioned above, with the exception of being less green.

3*d.*—Two drachms of the bruised seeds were submitted to distillation with six ounces of water. The peculiar odor of the seeds, while decocting, was soon perceived in the recipient, and the distilled liquid acquired a milky appearance. It was suffered to stand a short time, but no globules of oil separating, it was thrown back into the retort upon two drachms of fresh seeds, and the distillation repeated. A result was obtained similar to the first; no globules separated, but the liquid passed over with the milky appearance increased. The experiment was repeated for a third time, the distilled liquid being thrown back upon fresh seeds. Upon distilling into a recipient kept cool, a number of globules were seen floating upon the surface. These were separated by sulphuric ether. Upon carefully evaporating which, a few drops of a limpid essential oil remained behind, which possessed the odor of the seeds in a very concentrated state. Its taste was somewhat nauseous, but was devoid of marked bitterness. Like most other essential oils, it was of a pale straw color, and appeared to be less volatile than oils of the same class; as the oil, when dropped upon paper, required two or three hours for complete evaporation. The seeds from which this oil had been obtained, were found to be as bitter after, as before distillation.

4*th.*—A tincture was prepared by digesting two ounces of the seeds in two pints of alcohol, of 36°, for the space of fourteen days. The menstruum slowly acquired a slight yellowish tinge, possessed, but in a faint degree, the properties

of the seeds, and upon evaporation yielded but little more than a drachm of a reddish-brown extract, almost entirely soluble in water, and having considerable bitterness. This amount of extract was exclusive of fixed oil; for, when the tincture was considerably evaporated, a quantity of fixed oil rose to the surface, and was separated. That portion of the alcoholic extract which could not be dissolved in water, had the appearance of resin.

5th.—A much larger proportion of aqueous, than of spirituous extract, was afforded by the same quantity of seeds, and appeared to be possessed of almost equal bitterness, yet no effect upon the system was experienced by doses of a grain.

6th.—A decoction was prepared, by boiling an ounce of the bruised seeds, in half a pint of water, acidulated with sulphuric acid. The decoction was filtered, and a solution of acetate of lead gradually added, until a precipitate ceased to be thrown down, after which it was again filtered. Through the clear liquid was then passed a stream of hydrosulphuric acid, until sulphuret of lead ceased to be thrown down. The sulphuret was then removed by filtration, and the liquid raised to the boiling point, in order that any excess of hydrosulphuric acid might be expelled. A portion of pure magnesia was then added, and the vessel containing the mixture occasionally agitated. After a time presumed sufficient for chemical action to have taken place, the mixture was filtered, and the filter with its precipitate washed, then dried, and treated with boiling alcohol; it was again filtered, and the alcohol exposed to spontaneous evaporation in a glass capsule. A substance remained in a pulverulent state, around the margin of which, by means of the microscope, a number of minute crystals could be distinguished, the form of which was that of a three-sided pyramid. The greater portion of this substance was not crystallized. By dissolving a small quantity in alcohol, and applying it to litmus paper, which had been colored red by an acid, the blue color was perfectly restored, thus giving a decided proof of its alkaline nature. This substance was of a dirty white color, excessively bitter, and, as

is shown by the mode in which it was obtained, soluble in alcohol, but very sparingly soluble in water. It dissolved readily in acids, forming with the sulphuric and nitric, crystallizable salts. The muriate and acetate of this vegetable alkali could not be made to crystallize. All its salts were deliquescent. When a portion of this substance was placed upon a heated plate, it was melted like wax, and by increasing the heat was consumed without residue. About five grains of it were obtained from an ounce of seeds, which, after decoction, as stated above, with acidulated water, were found to be wholly deprived of their bitterness; whereas, when boiled with water, not acidulated, it was almost impossible to exhaust them, though decocted several times in successive portions of water. I have examined the description of delphia given by its discoverers, and find it to agree in every particular with the above substance, and, therefore, think it not a hasty conclusion to pronounce these two substances identical.

7th.—In the former part of the last mentioned process, when the mixture, after the addition of magnesia, had been filtered, the filtered liquor was found still to possess considerable bitterness. It was, therefore, evaporated somewhat, and then washed with sulphuric ether. Upon decantation, and the evaporation of the ether, a small quantity of a substance was left, having a very bitter taste, and which was supposed, at first, to be a peculiar principle, differing from delphia, as obtained by the last process; but, upon a further investigation, it was found to possess all the properties of that substance. We would consequently infer, that a minute portion of delphia remained dissolved in the liquid, from which the major part had been precipitated by the magnesia, and that this minute portion was abstracted by the ether.

8th.—In order to ascertain whether the stavesacre seeds, similarly treated, would yield similar results as above, one ounce of those seeds was submitted to decoction in acidulated water, and treated in every respect precisely as the larkspur seeds were in the last experiment. By precipitating with magnesia, delphia was obtained, and by washing the filtered

liquor with ether, another, though minute portion, was detected. Some doubt might be entertained as to the nature of the substance obtained by ether, for it is fair to suppose that an acetate of magnesia might exist in the filtered liquid, and that this was what the ether abstracted. But putting aside all other evidence to the contrary, acetate of magnesia was proved, experimentally, to be insoluble in sulphuric ether, and this salt is the only substance, other than delphia, that the liquid could contain.

9th.—A portion of the seeds were incinerated, and the incinerated mass lixiviated with hot water and filtered. To the filtered solution, a small portion of nitric acid was added, and the solution evaporated to dryness, when the readily recognised crystals of nitrate of potassa were left behind.

Upon lixiviating a second portion of the incinerated seeds with dilute nitric acid, filtering, and testing one part of the solution with oxalic acid, and another part with a solution of ferrocyanate of potassa, a copious white precipitate of oxalate of lime was obtained in the first case, and a deep blue color was produced in the second, indicating the presence of iron.

The constitution of larkspur seeds may, therefore, be stated to be as follows:—1st, gum; 2d, gallic acid; 3d, chlorophylle; 4th, fixed oil; 5th, volatile oil; 6th, resin; 7th, delphia; 8th, salts of potassa, lime, and iron.

SELECTED ARTICLES.

ART. II.—ON THE PREPARATION OF THE ESSENTIAL OIL OF MUSTARD.

(*Berliner Medicinist Zeitung.*)

THE essential oil of mustard, from its active medicinal qualities, will soon become a common remedy, and will no doubt be introduced into our pharmacopœia, as it has already been into the Hamburg new dispensatory. This oil belongs to that class of essential oils which do not pre-exist in the substances from which they are obtained, and whose mode of production by the agency of water is not yet satisfactorily explained. It is similar in this respect to the essential oil of bitter almonds, but differs from it in being unaffected by the oxygen of the atmosphere, and in containing sulphur as one of its elements. The statements of chemists, with regard to the preparation of this oil and the quantity obtained, are so various, that the author was induced to make some experiments, as to the best mode of preparation and the quantity to be obtained from a certain amount of black mustard seed.

Messrs. Bertram and Robiquet, (*Journal de Pharmacie*, Mai, 1831,) obtained from one killogram of powdered mustard, half a gross, or according to our weight, nearly thirty grains from every pound. M. Dann (*Buchner's Register*) obtained from thirty pounds of mustard seed, eleven drachms, and M. Aschoff, (*Jour. per Pract. Chem.*) from one pound obtained forty-two grains. It seems that M. Thibierge, introduced the use of this essential oil, but says nothing about the quantity obtained from the raw material.

The result of the author's experiments, prove that the method of distillation commonly used for the preparation of the essential oils, cannot be advantageously employed for the

oil of mustard; but he highly recommends distillation by means of steam, as affording far better results than the old method, in respect to the quantity and purity of the product. On account of its volatility, great care is to be taken in its collection. The apparatus for filtering with the exclusion of the atmosphere is very suitable for the purpose. The average quantity of the essential oil obtained from the pound of powdered mustard seed, was forty-two grains, but there existed a great difference in amount from different parcels of the seed. The author states, that the Dutch seed is preferable to either the German or French.

The oil obtained was of a yellowish color, but the first portions that came over appeared white; its specific gravity at 62° F. was 1.020, different from that given by M. Fontanelle, 1.0387; the oil when exposed to a low temperature appears opalescent, from having dissolved in it a small quantity of water. It dissolves sulphur and phosphorus, and on long exposure to the atmosphere it lets fall a sediment consisting of sulphur; it prevents fermentation.

According to analysis it consists of

Carbon	49.84
Nitrogen	14.41
Hydrogen	5.09
Oxygen	10.18
Sulphur	20.28
	<hr/>
	99.80

Properties and method of using the volatile oil of mustard seed.

The volatile oil of mustard seed, after many successful trials, is proved to be an effectual irritating remedy, suited to fulfil the counter-stimulant plan of treatment, and capable of increasing or exalting the vital actions in debilitated or paralyzed organs. It is now kept in all the principal apothecary shops in Germany. On account of its volatility, the greatest care is necessary to preserve it, as even when dilute and kept

in closely stopped vials, excluded from the light and heat, it loses its potency. It possesses so penetrating, and strong a smell of mustard, as to produce a painful sensation in the nose and eyes, with an increase of secretion, and so powerful is it, that when brought in contact with the sound skin, intolerable heat and burning, with intense redness and vesication, are the result. Hence, if used for medicinal purposes, it must be in a most dilute form. For external application, thirty drops may be dissolved in an ounce of *spt. vini*, or six or eight drops in a drachm of *ol. amygdalæ*, which solutions have still the characteristic odor and taste. There are two modes of external application. First, one of the above preparations may be rubbed on the skin by means of a piece of flannel or linen dipped in it; this method answers well in general, especially in the cases of children and females, and upon places where the skin is tender and not impaired in sensibility. The solution, thus applied, evaporates in a few minutes, leaving a sensation of burning and redness; parts contiguous to those affected are to be selected, and the application may be repeated after intervals of from four to six hours.

2. Pieces of flannel or linen, moistened with the solution, may be applied and retained in their position, until the active principle evaporates, which occurs generally in eight minutes. This method is suited to patients with a less irritable skin, or in whom the sensibility has been impaired by disease. The burning sensation immediately is experienced, and sometimes becomes intolerable, the patient tearing off the pledgets, under which the skin appears still more reddened and even blistered. In chronic cases it is sufficient to make the application twice a day, but not over the same places, from the excessive irritation.

As the effect of this essential oil upon the human system is so energetic, it is only calculated to be employed as a contra-irritant in diseases without excitement, as in chronic rheumatism, and affections of joints, its attendants, where it presents some advantage over blisters. It will, likewise, prove servicable in neuralgia, odontalgia, paralysis, &c., in which the

inflammatory condition has been subdued by bleeding, general or topical. The following case affords an example of its efficacy.

A female, aged twenty-seven years, had, during the last four years of her life, suffered from neuralgia, originating from the spinal column, in the region of the upper dorsal vertebræ; the paroxysms were extremely violent. The iron had been used, but without effect; and the solution of volatile oil of mustard was applied morning and evening, with decided mitigation of the symptoms, and diminished frequency of the paroxysms.

It has also been employed successfully in colic.

If given internally the proportion is two drops to a six ounce mixture; dose, \mathfrak{z} ss.

ART.—III. STATE OF PHARMACY IN PERSIA.

By M. JULIA DE FONTENELLE.

MEDICO-CHIRURGICAL and pharmaceutic knowledge is little advanced in Persia; in serious diseases the Persians still betake themselves to the predictions of astrologers, and to the mystic incantations of their *hakkins*, (doctors.) Believing in the singular doctrines of hot and cold diseases, and in male and female remedies, which they have derived from the works of the Arabians of the twelfth and thirteenth centuries, as, for instance, *Rosa*, *Abenzoar*, *Avicenna*, *Sibusenna*, &c., ignorant, moreover, of the first elements of anatomy, of physiology, and chemistry, they remain stationary, and repel all attempts to instruct them in the true principles of the art. In fact, whoever was seen dissecting would be regarded as impious; and he who would apply himself to chemical researches, would be supposed to be in correspondence with the devil, and would be regarded as a magician. The art of curing is divided, in Persia, into three branches--the

doctors or *hakkins*, the *druggists* or *pharmaciens*, and the *barbers* or *surgeons*. The *pharmaciens* have small shops in the bazaars, where drugs are exposed for retail, which consist, for the most part, of dried herbs, of plants for fomentations, infusions, and decoctions, and these are the most lucrative articles of the profession; within a few years, they have received, by way of Georgia, small parcels of chemical agents fabricated in Europe, especially at Moscow, such as the *sulphates of iron and copper*, *sulphate of quinia*, *alum*, *borax*, *tartaric acid*, *bitartrate of potassa*, *the carbonates of soda and potassa*. *Calomel* is sometimes found in their shops, which they call *white powder*, but only in the best provided are to be found the antimonial preparations; they likewise possess euphorbium, elaterium, castor oil, senna, rhubarb, gum arabic, and a number of aromatic herbs, which are procured in the mountainous districts.

The only formulary possessed by the *pharmaciens*, or Persian druggists, which is still in manuscript, is that of *Noureddin Mahomet*, *Abdalla-hakkin*, *Ainel-Melek-Shiragi*; in it are to be found numerous insignificant and useless substances. It has been evidently compiled from Greek, Latin, and Arabian authors. The department in which they possess the most information, is that of poisons, the largest proportion of which appears to belong to the vegetable kingdom, although they know how to employ arsenic, and the deutochloride of mercury. They obtain the latter from Tiflis in Georgia. They are generally the passive agents of their princes, who pay them well for the criminal service of poisoning; in order the better to conceal their proceedings, they unite them with astrological predictions, so that the victim is led to attribute the result to the terrible and extraordinary action of certain unfavorable conjunctions of the stars, which exercise a deadly and destructive influence upon him. The Persian apothecaries preserve the most profound secrecy as to the nature of their poisonous combinations; those only which are known, are arsenious acid, corrosive sublimate, cinnabar, opium, the powder of the diamond

or emery. The last, which they mix with boiled rice, produces, as it is said, a violent dysentery, generally terminating in death. One of their most deadly preparations is composed of the juice of euphorbia, a very venomous insect, and the mucus of the intestines taken from a person who has died of dysentery. According to them, this combination produces either dropsy, an intestinal inflammation, or typhoid fever. The Druses, certain tribes of Libanus, and of different parts of Syria, also regard this mucus as a powerful and energetic poison.

The Persian pharmaciens have in general the worst reputation; crafty and servile, they do not scruple to obey the sanguinary will of their master, even at the sacrifice of their dearest friends. The weights in use are: the *shaf-gran* and *demi shaf-gran*, silver Persian money, worth twenty sous and ten sous, the weight of which is nearly our half drachm. They also employ grains of barley. Their largest measures, are the *oka* and *manu*, which vary in different localities. A most common article in their shops, is the *choub-chini*, or *China root*, which they employ in all diseases as a sovereign specific. When it is administered, the patient keeps his room, closes the door and windows, and prevents the access of the external atmosphere. A strong decoction of *choub-chini* is then administered to him, and he is covered up in clothes until a profuse perspiration is induced.

But the most curious part of their shops, is that devoted to prophylactics. These, in general, are bezoars, or holy stones of Mecca. The *padzecher*, say they, is the king of medicines—it is the most effectual preserver of life: a venomous insect, dare not attack the fortunate being who is possessed of a bezoar; the scorpions avoid it with care, and look, when it has passed them, to see if they retain their tails; the flies avoid it; the serpents never pursue the way that it has passed over; it is useless, say the princes, to try to poison a man who has one of them, for a charm preserves his life. The apothecaries obtain them from Bockara, India, &c., and often at high prices, (from three to four hundred francs.) They apply

them to the bites of scorpions; first drawing them across their chest, warming them by their breath, and steeping them in fresh milk. This application is accompanied with a supplicatory prayer: *Bizinellah, el rahman, el rathecam, la illa en hulla*, (in the name of the all powerful, and all merciful God, there is no other God but God.) Sometimes in these shops are to be found small quantities of sarsaparilla, called by the Persians *sarsa*, and *cascarilla*; sometimes, also, there are brought from Tiflis small quantities of nitrate of silver, which they name, as also do the Arabs, *hayrgehenna*, (infernal stone.) Within a few years, the English have sold to the druggists of Ispahan and Bagdad, small quantities of ipecacuanha and tartar emetic, which is resold at eighteen sous the grain. They also possess a large number of substances capable of producing abortion. They also sell *henna*, to color the feet and hands, and blacken the hair.

The Persian pharmacien or druggist, is always to be found sitting in his shop, his legs crossed, and smoking his hookah. He receives his customers with great politeness, asks if you are in good health, and assures you that your visit has changed his shop into a garden; that your person is in his eyes more precious than all the treasures of Arabia; finally, if you be a doctor, he adds that your science penetrates his drugs and your condescension his heart.*

*We hope to give hereafter to our readers some scientific and economical details upon Persia; two pupils of the school of Pharmacy of Paris, M. Cassan, son of the pharmacien of this name, and M. Charles Safosse, of the department of Orne, having gone to that country. They have promised to correspond with us upon the subjects connected with our studies.

A. C.

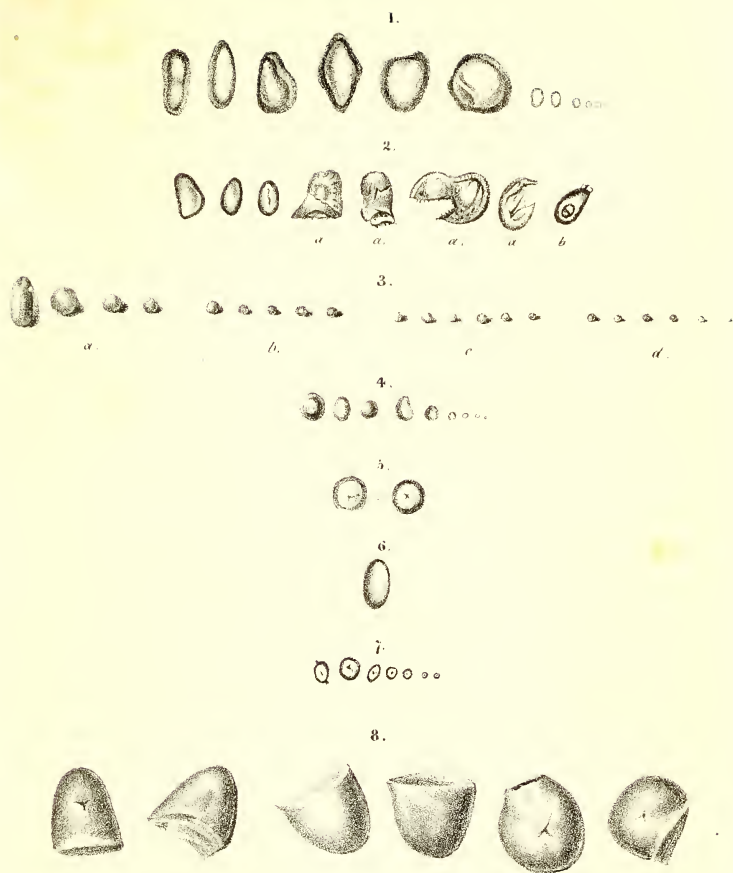
ART. IV.—OBSERVATIONS ON SOME OF THE SPECIES OF
FECULA EMPLOYED IN PHARMACY. By F. V. RASPAIL.

Extracted from his Nouveau Systeme de Chimie Organique.

WE have translated from the above mentioned work the researches of Raspail, as regards the microscopic characters of the most prominent feculæ. The difficulty of detecting admixtures of these substances, which are of frequent occurrence, renders it necessary that all the means of discrimination should be familiar to those who are liable to imposition. With the aid of a microscope of moderate power, the size, form, and organization of the grains of fecula can be sufficiently determined, and as these will be found to vary in each species, it affords a method of investigation which may be employed whenever doubts exist of the genuineness of an article. For the information elicited by these researches of Raspail, pharmacy is not a little indebted, as a flood of light has been thrown upon a hitherto obscure department, in which even the most practised are liable to be deceived; and we are certain that by placing it at the command of our readers, benefit will be experienced in their professional transactions.

Potato Fecula.

(*Solanum tuberosum*,) Pl. fig 1. This fecula assumes forms the most varied, and no other known kind possess dimensions as great. When fresh, there are observed, upon the surface of the grains, concentric rugæ, which often disappear by dessiccation. The largest attain the size of $\frac{1}{8}$ of a millimetre, the remainder vary from the $\frac{1}{10}$ to the $\frac{1}{25}$; they are oval, formed in concentric cocoons, gibbous, obscurely triangular, rounded and spherical, at least those of the smallest dimensions are. The potato is the only plant of which the fecula is used for ordinary culinary preparations; it is that which is of least value. To extract it, the tubercles are washed in water and scraped, they are then rasped, placed upon a sieve, and



1. Potato, fecula.

2. Sago

3. Granules of Sago

4. Wheat, fecula

5. Rye, fecula

6. Oat, fecula

7. Tapioca

8. Arrow Root

subjected to a stream of water; the marc alone remains upon the sieve; the fecula passes through and is caught in a vessel placed beneath. When the operation is terminated, the water is decanted, the fecula washed, and the water again decanted, and this is repeated until the water can remove nothing more that is soluble. Finally, the fecula is dried in the sun, or by a stove. It then presents itself in the form of an impalpable crystalline powder, having a light bluish tint; under these circumstances it can be affirmed that the grains are the least altered.

Sago Fecula.

(*Obtained from the medulla of certain palms, and in the Molaccas from that of the Cycas circinalis*, L., and *Sago farinaria*, Rumph.) Pl. fig 2. This fecula appears in commerce in the form of globules, which are from four to five millimetres in diameter; their surface is reddish and shining, their consistence hard, so that, before submitting them to examination with the microscope, it is necessary to allow them to remain in cold water for some hours. If fragments of the surfaces of these globules are then placed under the microscope, it is evident, that all the grains of fecula are broken, for their integuments, torn and burst open, (*fig. 2, a,*) are spread in myriads over the stage. Beneath the superficial layer, the grains, without having been broken, present internally, and sometimes upon a point of their surface, a granular arrangement, a corrugation, *b*, which is to be remarked in all the feculæ that have been momentarily submitted to the action of heat, after having been simply dried or hardened. In the centre of the globules, on the contrary, there are noticed only entire unaltered grains. All these circumstances complete the demonstration of the received opinion, that these globules have been torrefied upon a metallic plate, after having been formed by passing through a sieve, of which the holes, equal in size, are from four to five millimetres in diameter. By manipulating in the same way with the fecula of the potato, provided it be previously scented slightly with an aromatic substance, as

bergamotte, and the torrefaction be not pushed too far, or rather it be not torrefied but glazed, it is possible to make sago which resembles the exotic, and I am led to believe that that of commerce has frequently such an origin. The drug trade, which falsifies every thing, has doubtless not overlooked a falsification so easy.

The grains of this fecula, which have been dilated by heat, attain $\frac{1}{10}$ of a millimetre.

The sago, upon which the preceding observations were made in 1829, was procured from the shop of Bonastre, and at that time was the kind most common in the commerce of Paris.

At a meeting of the Academy of Medicine, Jan. 24th, 1837, M. Planche read an interesting essay upon sago, considered in a pharmaceutic and commercial point of view,* in which he has carefully described the different varieties met with in commerce. The author has had the politeness to present to us four distinct specimens, of which we shall now give the microscopic description.

One of these specimens is labelled *China sago*. It presents all the characters of that which afforded us the type in the first edition of this work. The globules, represented by *fig. 3, a*, vary in size from two to four millimetres, when of a round form; such as are oblong attain five millimetres; their surface is tinged of a violet brown, which somewhat penetrates into the interior; they are hard, and require more time than all the other species to soften in water.

The second specimen, of which *fig. 3, b*, represents the globules of their natural size, is labelled *Sumatra sago*. The largest of these globules do not exceed two millimetres in diameter. Their color is less deep, and their consistence is tender, and even friable; the molecules separate and dissolve, so to speak, in the water.

The third specimen, entitled *white sago of the Moluccas*, *fig. 3, c*, has the color of ordinary fecula; the largest of its

* See this Journal, Vol. 3, new series, p. 214.

globules do not exceed a millimetre, they are small angulated granulations, analogous to semoulia.*

Finally, the fourth specimen, labelled *rose colored sago*, of the Moluccas, *fig. 3, d*, presented the smallest globules; they did not exceed a demi millimetre; some of them were white, others possessed a light rose colored tint.

With the exception of the China sago, all these globules resumed a beautiful whiteness, after remaining an hour in water, and the grains of fecula were disintegrated by the least pressure.

These were the differences which these varieties offered upon simple inspection. I endeavored in vain to discover others with the microscope. In all, the external layer is formed of an aggregation of torn integuments, half empty, and which became entirely so in water, *fig. 2, a*; in all, the next layer presented altered grains, which were corrugated, delicate, flattened on one side, but still distended and round, from the contained soluble substance, and therefore refracting strongly the luminous rays, *fig. 2, b*. Finally, in the centre of the globule there were noticed entire grains of fecula, but of which the dimensions varied at each observation, and it was supposed that among molecules of such variable size and form, those of the same dimensions did not always chance to come to the centre. Hence it happened, that from a single observation there were established differences of character, with respect to the several varieties, which disappeared upon repeating the observation. The integuments the most dilated did not exceed in the aggregate $\frac{1}{5}$ of a millimetre, and the most entire grains the $\frac{1}{10}$. The general form and aspect were identical, and such as have been established, *fig. 2*. Hence it results, that the fecula which has served to form these varieties of sago, was derived from the same genus of plants; that it has not been subjected to ebullition but to torrefaction; for ebullition would have distended and not have torn the teguments, whilst by torrefaction the teguments of fecula assume the general forms of *fig. 2, a*. This fecula has been, while humid, submitted to torrefaction, without which all the

*A kind of vermicelli.

grains would have appeared themselves cracked, but retaining their form and ordinary dimensions, *fig. 2, b*; for in order that an integument shall split in distending, it is necessary that the grain should be plunged in a humid atmosphere, so that the soluble substance shall find a solvent at the favorable instant. Torrefaction could only affect them at the instant they were formed into globules, for its effects are well evinced upon the surface of the spheres, less so immediately beneath, and not at all in the centre. Now when an attempt is made to account for the formation of such globules, it must be admitted that the moist fecula has been pressed in a kind of strainer, that it is moulded by the perforations, and that after having passed through, it falls upon a surface heated at least to 100° R. The size of the globules, for this reason, depends entirely upon the diameter of the perforations. The varieties of sago, therefore, only indicate the difference of the mechanical methods employed.

Wheat Fecula.

(*Triticum sativum*, L.) Pl. fig. 4. The greater number and the largest grains of this fecula do not exceed $\frac{1}{20}$ of a millimetre; they are spherical, and commingled with *patulous* torn integuments, which depend upon the grains of fecula which have been broken by the mill. They are much more shining, rounder, and better preserved, if extracted from the seed when still a little green, and not allowed to dry upon the stalk. It is extracted in the following manner, for the use of linen manufacturers, who prefer it as *starch* for glossing fine linen. The starchmakers place the farina, coarsely powdered, in large vats, without even taking the trouble to separate the bran; they use also coarse meal and damaged wheat. They mix the farina with a certain quantity of water, to which is added a small quantity of *acid water*, the product of a preceding operation. The sugar and gluten contained in the farina speedily react upon each other, to produce, in the first place, *alcohol* and *carbonic acid*, then *acetic acid*, which dissolves the remainder of the gluten. This is what at first was called

acid water, or fat water; it is thick and sticky; it contains, according to Vauquelin, acetic acid, alcohol, acetate of ammonia, phosphate of lime, and gluten. After having washed the deposit by decantation, it is suspended in water, and the whole poured upon a hair sieve placed over a cask. The coarsest bran remains upon the sieve; the finest, with the fecula, passes through, and is deposited in a state of mixture. Agitation with water is again practised; the fecula by its specific weight separates from the bran, which entirely remains upon the surface of the precipitate, and takes the name of *black grounds*, (*grosnoir*.) Then the first layer is skimmed off, and a second and third by rinsing the upper part of the remaining mass; the residue is agitated with water, and placed upon a silk sieve, more or less fine. Another proportion of bran is then separated, and no more is to be done than to allow the fecula to deposit, and to wash it to render it pure. It is finally dried by moulding the precipitate in wicker baskets, lined loosely with linen cloth, after which it is turned out in a chamber upon a plaster floor; the blocks or casts should be broken by hand. The fragments are exposed to the air for some days, their surfaces are finally scraped, and they are dried completely by the heat of a stove. The lumps of starch then present little canals, which would appear to indicate a coarse state of crystallization, but which arise, in reality, from the action of the water in escaping. The amidon thus obtained is always more tenacious, and less friable than that of the potato, on account of a certain quantity of gum and gluten which these molecules carry with them on precipitating. This method is fitted to the extraction of the fecula from all organs that contain gluten,—barley for example,—but the starch manufacturers generally employ wheat.

Rye Fecula.

(*Secale cereale*, L.) Pl. fi. 5. The largest grains of this fecula attain $\frac{1}{20}$ of a millimetre, but they are distinguished from all other feculæ, by their flatness and the prominence of their margins, resembling disks, and for the most part marked on one

of their faces by a black cross, or three black rays united in the centre of the grain. Yet we have examined several specimens of rye, which were furnished in 1834, by M. Bosson, a pharmacien of Mantes, of which the grains of fecula had not this cross in their interior.

Oat Fecula.

(*Avena sativa*, L.) Pl. fig. 6. The farina of this grain has, to the naked eye, a cottony or downy appearance, in consequence of the presence of an innumerable quantity of hairs covering the grains. When this farina is observed magnified to 100 diameters, by Sellique's microscope, it appears as if there were presented to the vision an unequal mixture, consisting of large grains of fecula deeply shaded and opaque, oblong or ovoid, from the $\frac{1}{4}$ to the $\frac{1}{2}$ of a millimetre, and from $\frac{1}{10}$ to $\frac{1}{14}$, and by the side of, and sometimes adherent to, the surface of these first, small grains about $\frac{1}{200}$ of a millimetre. In the first edition of my work, from not having examined this mixture by a superior power, I in fact took the large opaque grains for grains of fecula, but I have rectified this error by using a power of 350 times. They are, however, glutinous cellules, as large as grains of fecula, and which are so clearly isolated, and appear under such rounded forms, as to resemble isolated grains of fecula. These glutinous cellules allow the fecula that they contain to be colored by iodine, and the transparency of their parieties is such as not to present an obstacle to the display of the blue coloring.

Arrow Root Fecula.

(*Maranta arundinacea*, L.) Pl. fig. 8. "Arrow root," says Berzelius, "being esteemed by some physicians as possessed of strengthening properties, is sold at a high rate, and it becomes of importance to distinguish it with certainty from other species of amidon. According to Guibourt, it is recognised under the microscope, for the grains of arrow root are translucent, and smaller than those of the amidon of the potato, although their form and size are as variable." Fully

congratulating Berzelius upon his new regard for microscopic observations, we cannot avoid deploring the species of complaisance which has led him to record, in the catalogues which he has invested with the authority of his name, observations at least as superficial as those he has borrowed from Guibourt. According to the characters assigned by the latter to the fecula of arrow root, there are in France perhaps an hundred vegetables, the fecula of which may be confounded with this Brazilian substance. What fecula is not translucent? And what fecula is more translucent than that of *Solanum*? Finally, what fecula, with the exception of that of the seeds of *Chara*, has not the grain smaller and the size as variable as that of the fecula of the potato? As to forms, how many are there whose forms vary to infinity? But as it unluckily happens, so far from being translucent, the grains of arrow root are more clouded than any that have been observed by us, and present characters that we have not met with in others. They are the following:

The fecula of arrow root examined in mass has a crystalline aspect, but dull; it is harsher to the feel than that of potato, and almost as harsh as wheat starch; it contains lumps which resist compression and crackle between the fingers. Examined in water by the aid of the microscope, it presents groups of five, six, and even ten or a dozen grains, which the most rapid motion and prolonged agitation do not separate, and which float together in the liquid.

But what is most distinct in the physical characters of this fecula, is the circumstance that each of these grains represents a half, a fourth, or a third, &c., of a solid sphere, some of them being small cylinders, with one extremity rounded like a cap, and the other flattened; while others exactly resemble a paint mullar; hence, each of these grains has always one or more angular surfaces, the refraction of which produces shadows so strong and so various, observed upon the contour of the microscopic image, that it would be supposed there were crystals presented to the eye. This structure is of such a nature, that a written description is better adapted to give an idea of it than the most exact figure. In addition, there are

perceived through their translucent surface, black lines, sometimes crossing each other like the letter T, at others in the form of stars, as in the fecula of rye; and by turning over the grains by a movement communicated to the liquid, these characters are determined not only not to be superficial, but on the contrary to exist in the very interior of the grain, which indicates an internal cellular arrangement analogous to that observed in the lentil;* the largest grains do not exceed $\frac{1}{25}$ of a millimetre. From the tenacious adherence of a great number of these grains to each other, and the angulated surfaces that they have contracted by agglutination, at the same time that they have preserved one of their surfaces spheroid, we are led to conclude that this fecula, composed of rounded grains, and a little soft, has been treated immediately after extraction by the heat of a stove, which heat has been somewhat elevated. I am confirmed in this opinion by the fact, that by ebullition sufficiently prolonged to distend the integuments of potato fecula until they have acquired twenty or thirty times their original diameter, the integuments of the fecula of arrow root attain scarcely four times the volume of the entire grain; which explains why Pfaff has found that ten grains of arrow root boiled in an ounce of water afforded only a mucilaginous liquid, whilst the same quantity of ordinary fecula, with the same quantity of water, afforded a gelatinous mass, a true *starch*.

Fecula of Tapioca.

(*Jatropha manihot*, L.) Pl. fig. 7. The grains of fecula of this root do not exceed $\frac{1}{35}$ of a millimetre. They assume the rounded form, and present in their centre a black point which arises from the play of light due to some circumstance in their internal structure, or to a depression upon their surface. There are two species of tapioca; that from the *sweet manioc*, and that from the *bitter*. It is from the root of the former

*The fecula of the lentil (*Ervum lens*, L.) presents each grain divided into three or four compartments, by black curved lines, which indicate the presence of as many internal cells.

that in America an abundant fecula is extracted, by the ordinary methods, and is known in the colonies by the names of *cipipa* and *moussache*.* The laundresses make use of it to whiten linen, although they prefer for this purpose the fecula of the arrow root, which they improperly name *sagou*. Arrow root, in fact, should furnish a less sticky starch.

The pulp of the root which remains upon the strainer, is dried and slightly torrefied; it is reduced to coarse meal, and sold under the name of coucouse, or tapioca; when boiled with milk, it forms an aliment as nutritive as agreeable.

The cassava or cassava bread, is a nutritious preparation, likewise derived from the root of the tapioca plant. When it attains the size of the arm it is washed; the pulpy matter is pressed out into sacks several times doubled, and then spread in layers one or two inches in thickness on iron plates, where, by baking, it assumes the form of cakes, which are dried in the sun upon the roofs of the negro huts.

The juice of the *bitter manioc* contains a poisonous principle, which appears to be a mixture of hydrocyanic acid.

Barley Fecula.

(*Hordeum vulgare*, L.) The grains of this fecula, which do not exceed $\frac{1}{40}$ of a millimetre, have the aspect and form of wheat fecula. The starch makers, submit this grain to the same processes as the last mentioned, to obtain starch.

Fecula of Corn.

(*Zea mais*, L.) Nearly all the grains of this fecula are injured by the mill, in consequence of great adhesion produced in drying by the oil, gum, and sugar contained in the perisperm of this cereal product. The greater number remain agglutinated together, and present the aspect of a cellular tissue with small meshes: all are puckered or more or less wrinkled, and more or less irregularly rounded; the largest scarcely exceed the $\frac{1}{40}$ of a millimetre, and these are

* In the French Islands of the West Indies.

not the most numerous. But if, instead of examining the fecula in the form of ground meal, it be examined as procured from the young grain, and at a period when the perisperm is still milky, the grains present another aspect; they are perfectly spherical, shining and entire, so that the proportions being preserved, it appears to me evident that more fecula would be obtained by expression of the seeds, taken a little in advance of maturity, than by grinding the dried seeds. For the entire and unbroken grains fall to the bottom of the liquid by the first method; whilst by the second, from being altered, broken, and torn by the mill, they yield their soluble substances to water, and remain suspended in the liquid, with the levity of simple integuments. This is the reason that Parmentier, who has employed the second method to analyze maize, obtained so little fecula from its farina, (*Mem. sur le mais*, Bordeaux, 1785.)

Fecula of the Orchis. Salep.

(*Orchis morio, mascula, pyramidalis, latifolia, conopsea, malculata*, L., besides other indigenous species of *Orchis*.) For more than twenty-four years, the French authors upon the *Materia Medica* have recommended indigenous salep as an excellent succedaneum for Asiatic salep. It is obtained by washing the tubercles of the *Orchis* in fresh water, stringing them like beads, and boiling them from twenty to thirty minutes; that is, until they commence to be reduced to mucilage; they are then withdrawn from the water, and dried in the sun, or by a stove. Within a short time, a discussion arose among the members of the section of Pharmacy of the School of Medicine; Vauquelin asserting that the tubercles of the *Orchis* contain an abundance of fecula; while Robiquet, on the contrary, declared that he could not find even traces of it; and since it is impossible to mistake the characters of the fecula in mass, and as both authorities are equally remarkable for the spirit of exactitude with which they proceed in all their researches, we are naturally led to conclude that the same organ might contain fecula, or in the same species be

entirely destitute of it. The following is the explanation of the anomaly:

The stem of the Orchis proceeds from a tubercle, by which it is nourished, and which is consequently exhausted daily. But in proportion as the stem rises, there is produced in the midst of many simple radicles, a new tubercle, which enlarges gradually, and survives the stem, as well as the original tubercle, in order to propagate the species. If it so happens that a chemist looks for fecula in the withered tubercle, he will certainly not find it; and it is probable that this was the case with Robiquet; but this same tubercle contained it before being exhausted by the nourishment afforded to the stem. If the new tubercle, when too young, be examined, again it will not be found. Hence it is necessary to collect the tubercles of the Orchis immediately after the flowers begin to fade; at which period the new tubercle is most rich in fecula and aroma.

The grains of the fecula of the Orchis, examined after having in the form of salep been reduced by ebullition, appear spherical, and do not exceed (the largest at least) the $\frac{1}{100}$ of a millimetre; in some species they are even the $\frac{1}{200}$.

Table of the greatest dimensions of the grains of feculæ enumerated.

Names of Plants.	Organs.	Dimensions.
<i>Solanum tuberosum</i> , Potato.	Tubercles,	$\frac{1}{8}$
<i>Cycas circinalis</i> , Sago.	Medulla,	$\frac{1}{10}$
<i>Avena sativa</i> , Oat,	Seeds, } Perisperm, }	$\frac{1}{14}$ to $\frac{1}{33}$
<i>Triticum sativum</i> , Wheat,	do. } do. }	$\frac{1}{20}$
<i>Secale cereale</i> , Rye,	do. } do. }	$\frac{1}{20}$
<i>Maranta arundenacea</i> , Arrow root.	Root,	$\frac{1}{25}$

Names of Plants.	Organs.	Dimensions.
<i>Jatropha manihot</i> , Tapioca.	Root,	$\frac{1}{3} \frac{1}{5}$
<i>Hordeum vulgare</i> , Barley,	Seed, } Perisperm, }	$\frac{1}{4} \frac{1}{6}$
<i>Zea mais</i> , Maize,	do. } do. }	$\frac{1}{4} \frac{1}{6}$
<i>Orchis latifolia</i> , Salep.	Tubercles.	$\frac{1}{5} \frac{1}{6}$

ART. V.—ON THE DIFFERENT COLORING MATTERS OF
LEAVES AND FRUITS.—By BERZELIUS.

1. *The yellow color of leaves in Autumn.*

THE change which takes place in the green foliage of trees previous to its fall, after an exposure to some nights of frost, is well known to be from a green to a fine orange yellow. This is observed especially in the *Betula alba*, the *Pyrus malus*, the *Ulmus campestris*, the *Fraxinus excelsior*, &c. The foliage of the *Betula alnus*, on the contrary, rarely becomes yellow, but falls while yet green; that of the oak does not become yellow, but brown. The foliage that has become yellow, sooner or later assumes this brown color, when it becomes dried after its fall. Different researches have been already made upon the yellow color of foliage. Macaire Prinsep has published the results of several experiments upon the autumnal color of leaves—his conclusion is, that the foliage in autumn ceases to disengage oxygen, but that it absorbs this gas from the air; there is then formed an acid which colors the foliage at first yellow and afterwards of a red color, and, that by neutralizing this acid by means of an alkali, the green color of the leaves may be restored; he considers these colors, as Clamort Marquart does, to be modifications of one and the same coloring matter, which he calls *chromule*. He states that this is the cause of the ordinary yellow or red

color of the petals of flowers. These results are by no means exact; the yellow foliage does not become again green by the action of any reagent; but the leaves having become red, recover their green color by means of potassa, because the red coloring matter forms green combinations with that alkali. Leopold Gmelin first directed attention to the inexactitude of the results of Macaire Prinsep. Inspired by this observation, I engaged in some researches upon the color of foliage altered by the influence of the cold of autumn. I have experimented especially upon the citron-yellow foliage of the *Pyrus communis*, which was placed, while yet fresh and immediately upon being gathered, in a flask, and completely covered with alcohol of 0.833, in contact with which it was left for forty-eight hours. The alcohol became of a yellow color, but the foliage still remained yellow, but paler than before; the alcohol was decanted, and the flask placed in an inverted position for some time; the foliage then became of a brown color throughout, wherever it was touched by the air, but in those parts in contact with the sides of the vessel the yellow color was preserved. Alcohol was poured upon the leaves several times, and each time it became of a yellow color; finally, the alcohol was boiled; it again took a yellow tinge, but became gelatinous on cooling.

The macerating liquors were distilled to one-eighth; there was then deposited, upon cooling, a granulent matter, which presented some appearance of crystallization. After the separation of this substance, the distillation was continued, until there remained nothing but the water of vegetation of the leaves. On the top of this yellow liquid, there floated a yellow, soft, fatty substance, which appeared to be identical with the granules which contained the coloring matter of the foliage. These granules did not exhibit, under the microscope, any indications of crystallization, but could be spread out by the fingers into a greasy yellow spot; it was mixed with a fatty oil, which I could distinguish, but could not separate completely, and another substance likewise fatty. It could be partly purified from the former, by digestion with a weak solution

of caustic potassa, which saponifies the oil, but dissolves only a small quantity of the fatty substance; the yellow fatty acids are precipitated from the alkaline solution by the hydrochloric acid, and we may by dissolving them in the caustic solution, much diluted, (5 or 6 drops to the ounce of water,) and precipitating anew, obtain them free from color. To deprive it of the latter substance, or the solid fatty matter, we must treat it with cold alcohol, in which it is not soluble. I have never as yet been able to obtain it perfectly free from these two fatty bodies. Such as I have obtained it, it has the appearance of a yellow fat, easily fusible, becoming liquid even at 42° ; when it becomes solid, it is transparent and of a yellowish brown; it is volatile without decomposition, but gives on dry distillation a rather brownish fat, but little soluble in alcohol, and leaves a residue of carbon. It is insoluble in water, but if, when melted, we pour upon it some hot water, it becomes transparent, swells up slightly, and becomes of a paler yellow, as if the water had combined with it chemically. When moistened with water, and exposed a long time to the air and light, it bleaches completely, and is converted into a fatty matter soluble with difficulty in alcohol, and precipitates in light white flocculi from a boiling saturated solution in alcohol. The yellow fat is soluble in alcohol in very small quantity. In this solution it does not bleach sensibly in the same period of time in which it becomes white in water. The alcoholic solution is precipitated by water, and then assumes a pale yellow milky aspect, which it retains even after the evaporation of the alcohol. It is deposited from the alcoholic solution during its spontaneous evaporation in the form of crystalline granules. Ether dissolves it largely, and leaves it, after evaporation, of a yellow color and transparent. In contact with concentrated sulphuric acid, it becomes brown, is dissolved sparingly, but with alteration, and gives a yellowish-brown liquid, which is precipitated by water, of a grayish-white color. It dissolves, but in very small quantity, in caustic potassa, and when thus dissolved, if it be exposed for some time to the influence of the air and light, it bleaches. It is precipitated

from its solution in potassa by the acids, in pale yellow flocculi, which, when properly washed, do not redden litmus paper. It is but little, if at all, soluble in carbonate of potassa, and insoluble in caustic ammonia, to which, however, it communicates a yellow color.

This coloring matter is then a peculiar fatty matter, intermediate between the fatty oils and the resins, which may be whitened without losing its properties, of difficult solubility in alcohol, and of being fatty and oily. We may name it *zanthophylle* (from *ξανθος* yellow, and *φυλλον* a leaf.) We have every reason to presume that in the disappearance of the green color and its change into yellow, this is produced from the green by means of a change of organization of the leaf, effected by the cold, and which modifies the organic operations. But it was in vain that I endeavored to reproduce the green color by means of the yellow; besides, I could not succeed in changing the green to yellow. The brown color of the foliage has nothing in common with the yellow. It is produced by an extractive principle, before colorless, which, after the disorganization of the epidermis of the leaf, becomes brown by the action of the oxygen of the air; it then communicates to the fibres of the skeleton of the leaves a brown color which cannot be taken away even by digestion in a weak solution of caustic potassa, or which the long continued action of sulphuretted hydrogen cannot destroy.

2. *Red coloring matter of fruits.*

The red color of many species of fruits has, in general, been considered as a blue color reddened by an acid; this may be the case in many instances, but it is not so in all; and consequently, the coloring matter of those which are exceptions should be separately determined. I have examined the color of the cherry, (*Prunus cerasus*;) and of the currant, (*Ribes nigrum*;) both contain the same coloring matter, and this is not a blue. The presumption that it was this latter color may have arisen from the fact that the juice of these fruits gives a blue precipitate with acetate of lead; but these precipitates are the malate and citrate of lead, with which the coloring mat-

ter is combined, and from which it may be withdrawn, slightly mixed with a free acid, by the use of sulphuretted hydrogen, and after the separation the acids act with it as I am about to describe. To obtain it pure, the acids must be completely separated; the best agent for this, is chalk in fine powder, which gives rise to a deposit of the malate and citrate of lime. Lime is then to be added in small quantities, to precipitate the neutral malate of lime contained in the liquid. The liquid is to be filtered, and mixed with a small quantity of acetate of lead; the bluish-green precipitate which is thereon formed, is to be separated, because it may contain some malate of lead, and the acetate of lead again added as long as any precipitate is produced. The green precipitate is to be collected on a filter and washed with water, after such a manner that it shall be always covered and protected against the least access of air. It is then to be decomposed by sulphuretted hydrogen, and the filtered liquor evaporated to dryness in a vacuum, by the aid of sulphuric acid; the coloring matter which remains is to be dissolved in anhydrous alcohol, which leaves behind the coloring matter altered by the air, and the pectine or pectic acid. By distilling off the alcohol, and drying the residuum in a vacuum, the coloring matter is obtained as a beautiful red, transparent and brilliant mass. A great loss is sustained if we obtain in the beginning, by means of the acetate of lead, the blue precipitate of the malate or citrate of lead, then precipitate from the filtered liquor the coloring matter by subacetate of lead, and decompose the washed precipitate by sulphuretted hydrogen. In this state the coloring matter is soluble in every proportion in water and alcohol, but is insoluble in ether. It remains after the evaporation of the aqueous solution on a salt water bath; but it is under the form of a deposit less soluble in water, and but little so in alcohol; it is another coloring matter of a reddish-brown and less alterable; if we add to an aqueous solution of the coloring matter, a small quantity of lime water, it precipitates of a greenish-gray. The coloring matter not yet precipitated is red, but of another shade, for it contains a combination of lime

with an excess of the coloring matter. If the natural color were blue, the solution should then become blue, and not red, because all the free acid is saturated. The coloring matter, on the contrary, as we have seen, forms with the malate or citrate of lead a combination which is of a beautiful clear blue; but this color does not exhibit any of the peculiar shade of the coloring matter; dissolved in alcohol, it may be preserved without oxidation. It does not oxidate, however long it may be kept in contact with the free acids in the juice of the fruit. The brownish-red deposit is slightly soluble in water; its solution is of a deep red, but potassa forms with it a deep brown solution. It forms with ammonia a neutral soluble combination, and an insoluble, or but slightly soluble acid, of a reddish-brown color. The neutral green combinations of the pure red coloring matter change, while in a moist state, under the action of the air, into this brown combination. The precipitate by lead is, however, an exception, since it is permanent, both during washing and drying. I have kept, without alteration, for six years, the green precipitate obtained from the bird's service, (*Sorbus acuparia*,) by means of acetate of lead, the malic acid having been previously separated by carbonate of lead.

3. *The red coloring matter of leaves in Autumn.*

We perceive, in the autumn, the leaves of certain trees to become red. All trees and bushes upon which I have seen these red leaves, bear red fruit: (*ex. Sorbus acuparia; Prunus cerasus; Ribes grossularia*, var. *rubra; Berberis vulgaris*, &c.) The red color which they contain is so much allied to the preceding, that they may be considered as identical. However, I have only examined the foliage of the cherry, and especially the red currant. The leaves of this latter becomes oftentimes so red as to have the appearance of the ripe fruit. The coloring matter was extracted by alcohol, which, after distillation, left a red liquor, from which, by filtration, a resin and a fatty precipitate were separated. The filtered liquor was mixed with water, without being troubled,

and then with the neutral acetate of lead; there was formed a precipitate of a fine grass-green, which became, in a few moments, of a brownish-gray; the acetate of lead was added as long as the precipitate changed color, and until the last portions retained their green hue. It was then filtered; that which remained on the filter was a combination of the oxide of lead with the vegetable acids of the leaves, and with a brown coloring matter formed by the action of the air upon the red solutions, both aqueous and alcoholic. The remaining coloring matter was precipitated of a fine grass-green, by the acetate of lead, collected upon a filter, well washed, decomposed by sulphuretted hydrogen, and evaporated to dryness in vacuo. The solution, precipitated by the acetate of lead, still yielded a small quantity of a yellowish-green precipitate when the free acetic acid was saturated by subacetate of lead; from this precipitate the same coloring matter could be obtained as from the former.

This coloring matter, which we may call *erythophylle*, (from *ερυθρος*, red, and *φυλλον*, leaf,) if not exactly the same as that of fruits, is, in appearance and chemical properties, similar to that of the cherry and black currant. It differs but a shade in its color, which is a little deeper, and bordering on blood-red, and in the property which it has of forming green or yellow combinations, while those of the coloring matter of the cherry and grape are green or blue. The deposit which is formed on evaporating its solutions, is a brownish-red, more clear than the former, and gives, with bases, brownish-red combinations, which do not, in the air, so easily become of a deeper tint, like that of the fruits; but do these tints belong to the deposit of the coloring matter of the leaves, or rather are they peculiar to the red currant? This I have not examined, and do not know. The red coloring matter of leaves, half precipitated by lime water, yields a green precipitate, while the liquid assumes a paler red; thus the coloring matter is not originally blue.

Journ. de Pharmacie.

ART. VI.—POISONOUS PROPERTIES AND USE OF
TANGHIN.

Du PETIT THOUARS is the first who, in his *Genera Madagascariensia*, has spoken of this plant, which he designates by the name *Thanghinia veneniflua*. More recently Mr. Hooker, profiting by his relations with Mr. Boyer, of the island of Mauritius, has published a complete description of it in the *Botanical Magazine*, accompanied with a plate, under the name of *Cerbera tanghin*. The following is a subsequent description given by M.M. Boyer and Hilsenbey. This tree, say they, attains thirty feet in height, and produces a whitish gelatinous juice; its leaves are lanceolate, entire, similar to those of the *Nerium oleander*, or the periwinkle of Madagascar, *Vinca arborea*; the flower is of the same color, and nearly resembles that of the two plants mentioned, which belong to the family Apocynæ. The fruit is a *drupe*, opening at maturity; it has the form and size of a lemon; the surface is shining, yellow, and streaked here and there with red; in the centre is found a stone like that of the peach. This fruit undergoes a change from age; it becomes red and poisonous in the centre at the period of maturity, which is distinguished by its withering, and becoming wrinkled upon the surface. It is in this state that it is employed to prepare the drink which plays so conspicuous a part in the annals of the judiciary of Madagascar. In some places, the condemnation of criminals depends upon the circumstance of their living or dying after drinking the *tanghena*. If the dose produces death, the individual was culpable; if he survives, his innocence is evident. At Emerina, where Mr. Hooker has resided, this poison is only administered in a very small dose; it then acts as an emetic. The accused, after having eaten a sufficient quantity of boiled rice, swallows, without chewing, three pieces of the skin of a fowl as large as a crown piece. Then is administered the test draught, composed of a small quantity of the pulverized root

of tanghin in the juice of banana. The *panazon doha* (he who pronounces the imprecation,) places his hand upon the head of the accused, and pronounces the formula of imprecation, invoking all kinds of evil upon him if he be culpable. Shortly after, a large quantity of rice-water is administered; the necessary effect is vomiting; and if, upon examination, the three pieces of skin are found, all is well, the individual is legally acquitted; but if it be otherwise, *the crime has produced its stain*, which to him is irreparable. When the accusation is serious, the potion is so concentrated that the arraigned person often loses his life.

The tanghin must be a very active poison, since it produces its effects even after the stomach is filled with aliment, and the administration of a large quantity of rice-water.

J. DE F.

Journ. de Chimie Med.

ART. VII.—ON THE REACTION BETWEEN QUINIA AND AN AQUEOUS SOLUTION OF CHLORINE AND CAUSTIC AMMONIA. By RUDOLPH BRANDES.

It is some years since the remarkable reaction between quinia and chlorine with ammonia has been made known. This reaction consists in the coloring of the solution of a very intense emerald green. But the production of this color depends upon certain proportions of these substances being used. I attempted to determine these proportions, and have arrived at the following results:—Half of a grain of sulphate of quinia in an ounce of water, on being mixed with 16 to 20 drops of an aqueous solution of chlorine, and then 16 to 20 drops of an aqueous solution of ammonia added, gave a green flocculent precipitate. Half a grain of sulphate of quinia in an ounce of water, mixed with 60 to 100 drops of the solution of chlorine and 10 drops of ammonia gave, also a solution of a very in-

tense emerald green, but without the least trace of a precipitate; a larger quantity of the ammonia had no effect upon the color; but a great increase of the chlorine destroyed it to such an extent that the solution of sulphate of quinia with 100 drops of the chlorine appeared of a greenish yellow; on the addition of ammonia, and with 400 drops of chlorine, it became of the yellow color of white wine; when the colored liquid was saturated with sulphuric acid, the color disappeared, but was again restored by saturating the free acid by means of ammonia.

The solution of chlorine causes a decomposition of the quinia, and this decomposition varies in degree according to the quantity of chlorine, whether we obtain a green precipitate, a green solution, or a yellow solution by an increase in the quantity of the chlorine. The most intense color is produced by using 1 grain of sulphate of quinine, 100 grains of water, 200 drops of the aqueous solution of chlorine recently prepared, and 10 or 20 drops of the solution of ammonia. This color is so intense that we can dilute the solution with twenty thousand parts of water, and it will still retain an appreciable green tint.

The green precipitate is solid, and has the following properties. A green color, an obscurely bitter taste, similar to that of quinia; heated by itself, it fuses, and gives off pyro-ammoniacal vapors; it is insoluble in cold water, and almost insoluble in boiling water; it is fusible, and does not appear to contain any chlorine; it is insoluble in ether, but very soluble in alcohol, and diluted sulphuric, nitric, hydrochloric, and acetic acids. The solutions in these acids were not green but red, similar to red wine, and on being saturated with ammonia, the precipitate was again separated with its original green color. Heated with nitric acid, the green precipitate was changed into a yellow bitter substance.

On evaporating the green ammoniacal solution of quinia, it became by degrees of a red color, and left a reddish residue, mixed with much ammoniacal salt. By treating this residue repeatedly with alcohol, and by repeated evaporation and re-

solution to separate the hydrochlorate of ammonia, there remained a brownish-red substance, of a bitter taste similar to quinia, very soluble in water and alcohol, insoluble in ether and fusible, like the green precipitate, by heat. The aqueous solution of this red matter is precipitated by the subacetate of lead, by the chloride of tin, but not by the salts of iron; this matter does not possess the characters of quinquina red.

From the preceding statements it will be perceived that quinia is decomposed by an aqueous solution of chlorine, at ordinary temperatures; by treating the solution of decomposed quinia with ammonia, different substances are obtained, viz:

1. A green substance, insoluble in water.
2. A red substance, soluble in water.
3. A brown substance, soluble in water.
4. Finally, a green substance, soluble in water, but which we are unable to isolate, because it becomes changed by evaporation of the solutions, into the red and brown substances.

In the interesting memoir of M. Pelletier, upon the action of chlorine upon the vegetable bases, this celebrated chemist comes to different results; but M. Pelletier caused the chlorine gas to act upon the quinia, and thus the results were not similar, a difference which I have also perceived. The reaction of chlorine in aqueous solution, at common temperatures, gives rise to several bodies of a determinate composition, as I think, and elementary analysis only, can elucidate the mode in which these different matters are formed.

Journ. de Pharm.

ART. VIII.—DESCRIPTION OF A NEW MODE OF CHEMICAL ANALYSIS. By M. EBELMAN.

No one has as yet endeavored to ascertain directly, in analysis, the quantity of oxygen which many metallic compounds absorb, while dissolving in the oxidating acid usually employed, such as the nitric or nitromuriatic acids. This is owing to the difficulty experienced in estimating exactly, the oxidating value of the acid used, and likewise the variable composition of the gas which is disengaged during the reaction. If it is known beforehand, what quantity of oxygen the solvent used will yield, and if we ascertain the quantity disengaged, it is evident, that the difference will be the exact proportion which has been absorbed by the metallic compound during solution. The process which I am about to describe, appears to me to fulfil these two conditions.

It is known that the hydrochloric acid in dissolving the oxide of manganese disengages one equivalent of chlorine for every equivalent of oxygen which the oxide will yield in passing to the state of protoxide. It is also known that this mixture will act upon the same metallic compounds, as the aqua regia with an excess of hydrochloric acid. If, then, we mix the body to be analysed with a determinate weight of oxide of manganese, of which the composition is previously known, treat the mixture with pure hydrochloric acid, ascertain the quantity of chlorine disengaged, and deduct it from that which the oxide of manganese should itself yield, the difference will be the quantity absorbed, and consequently its equivalent in oxygen.

The estimation of the quantity of chlorine disengaged, may be made by the different methods already employed in the analysis of manganesian minerals. Thus the chlorine gas may be collected, or, what is better, may be caused to react upon an aqueous solution of ammonia, and the resulting nitrogen gas measured, which will be one-third of the volume of the chlorine produced. But the use of pneumatic methods are

not without difficulty, and always require a series of corrections for temperature, pressure, and the hygrometric condition of the gas. It appears to me to be preferable to receive the chlorine in a clear solution of sulphurous acid, mixed with muriate of baryta. The sulphate of baryta, which is the result of the reaction of the chlorine upon the solution, will serve to designate the corresponding quantity of oxygen.

The operation is to be performed in the following manner: The substance under examination is to be powdered very fine, especially if it be attacked with difficulty, and mixed with a known weight of oxide of manganese. The quantity of oxygen likely to be absorbed, may be nearly estimated beforehand, and by doubling the quantity of manganese which may be supposed sufficient to furnish the necessary oxygen, we may be satisfied that we will obtain a complete solution of the metallic matter. The operation is to be conducted in nearly the same manner as the analysis of the minerals of manganese themselves, only it is proper to carry on the process more slowly, so that time may be allowed for the brown solution of manganese to act upon the substance to be analysed. When the solution is finished, and all the chlorine has passed into the vessel containing the liquid sulphurous acid, an excess of muriate of baryta is to be added, and the excess of sulphurous acid driven off by boiling; the sulphate of baryta precipitated is then to be separated by a filter, calcined and weighed.

One atom of sulphate of baryta, 1458.09 is equivalent

To one atom of oxygen, 100.

And to two atoms of chlorine, 442.64

We should know, in advance, the quantity of sulphate of baryta which the oxide of manganese should produce by itself; the difference will correspond to the quantity of chlorine, and to the quantity of oxygen remaining in the metallic solution.

One gramme of pure peroxide of manganese loses 0.18 of oxygen when reduced to protoxide; it will consequently produce 2 gr. 62 of sulphate of baryta.

This process, of which the results appear to me to be very exact, seems susceptible of very numerous applications in analytic chemistry. I would point out particularly the following:

1. In treating by the method pointed out, a known weight of a metal, slightly, or not at all acted upon by hydrochloric acid, we ascertain at once the composition of the chloride formed, or of the oxide remaining in solution in the excess of the hydrochloric acid. In certain cases, it is very difficult to determine this composition by the means hitherto employed. In fact, it often happens that we cannot obtain the chloride in a constant state of composition, either from its volatility, or on account of a commencement of a decomposition produced by the heat. It is the same of certain oxides which we cannot obtain perfectly pure. I would quote, for example, the perchlorides of gold and platinum, the composition of which, I think, it will be very easy to verify by aid of the process pointed out.

2. Likewise in certain cases where it is not possible to take the exact weight of the substance to be peroxidized, whilst the quantity of oxide produced may be ascertained with precision. All the products of the oxidation of phosphorus, below phosphoric acid, may be analyzed in this manner, by ascertaining the quantity of phosphoric acid produced during the reaction, and the oxygen required to produce the change.* The body which serves to determine the quantity of oxygen, weighs fourteen and one-half times as much as the oxygen, which lessens very much the chances of error.

3. We may determine the relative proportion of two oxides of iron, by mixing them with an excess of the peroxide of manganese, and treating the mixture by hydrochloric acid.

* To analyze phosphatic acid, M. Dulong measured the quantity of chlorine absorbed by an indeterminate quantity of this acid during its change to phosphoric acid, and then weighed the phosphoric acid formed. This process presents considerable analogy with that which I have described.

This process is as simple as that which consists in treating the hydrochloric solution of the two oxides by sulphurous acid, and ascertaining by the aid of the muriate of baryta, the quantity of sulphuric acid which results from the change of the protoxide into the peroxide of iron. It is likewise a more convenient process, when acting upon a silicate soluble in the hydrochloric acid, for on treating the solution of the two oxides, by means of the sulphurous acid, it is very difficult to separate the sulphate of baryta produced, from the gelatinous silica with which it is mixed.

Likewise there are certain minerals in which iron appears to be in the state, partly of protoxide and partly of peroxide, which are not soluble in hydrochloric acid, while they readily dissolve in nitromuriatic acid. We have, then, no direct means to determine the relative proportions of the two oxides. I allude in this remark to Wolfram. Vauquelin has analyzed a variety of this mineral, coming from the department of Haute-Vienne, and he supposes that the iron exists in it, one-half in the state of protoxide, the other half as peroxide, (*Treatise on Analysis by the Dry Way*, Vol. II., p. 264.) By using, instead of the nitromuriatic acid, the hydrochloric acid, and acting upon a mixture of this mineral and peroxide of manganese, in the manner which I have pointed out, we may easily ascertain the relative proportion of the two oxides.

Two atoms of the protoxide of iron, $2 \text{Fe} = 878.40$, absorb one atom of oxygen $= 100$ in passing to the state of peroxide Fe_2O_3 .

Thus a difference of 1458.09 in the weight of sulphate of baryta obtained, corresponds to 879.40 of protoxide of iron.

One of sulphate of baryta corresponds to 0.602 of protoxide of iron.

4. We may verify in a convenient manner the laws of composition of a great number of metallic salts, by comparing the total quantity of oxygen absorbed, with that which remains combined, as an electro-negative element in the solution. I will state, for example, an examination which I made

of a cubic galena with large faces, which did not contain any sensible quantity of foreign matter. The peroxide of manganese used did not contain any baryta. Examined by itself, it gave for one gramme, 2 gr. 35 of sulphate of baryta, corresponding to 0 gr. 16 of oxygen.

One gramme of galena, finely powdered, was mixed with three grammes of peroxide of manganese. This mixture was treated by hydrochloric acid, with proper precautions. The galena was completely dissolved without depositing any sulphur. The sulphate of baryta resulting from the reaction of an excess of chlorine upon a solution of sulphurous acid, mixed with hydrochlorate of baryta, weighed, after calcina-

tion, 3 gr. 19

The three grammes of peroxide of manganese, treated by itself, with hydrochloric acid, should yield

sulphate of baryta, 7 gr. 05

The whole quantity of oxygen absorbed, corresponds,

then, to sulphate of baryta, 3 gr. 86

And is, consequently, equivalent to 0 gr. 265

On the other hand, by precipitating the solution of lead, by means of the hydrochlorate of baryta, I obtained, sulphate of baryta 0.97; that is to say, very nearly one-fourth of 3 gr. 86. This agreement allows us to conclude, independently of every theory of the composition of the acids and sulphur, that there is a simple agreement between the quantities of oxygen, which sulphur and sulphurous acid take in passing to the state of sulphurous acid; and on the other hand, that there exists equally a simple agreement between the quantity of oxygen absorbed by the sulphur, to pass to the state of sulphurous acid, and that which the lead requires to be changed into protoxide.

But as we possess the knowledge of the composition of the sulphate of baryta, and that of the acids of sulphur, we may say:

Sulphate of baryta, 0 gr. 97, contains sulphuric acid, 0 gr. 331 composed of sulphur, 0 gr. 132, and oxygen, 0 gr. 199.

Or the whole quantity of oxygen absorbed is 0 gr. 265.

That taken by the lead to pass to the state of protoxide, will then be $0.265 - 0.199 = 0.066$, that is to say, exactly one-third of the quantity taken by the sulphurous acid in changing to sulphuric acid. We know, likewise, that on evaporating to dryness the solution of lead in muriatic acid, the neutral sulphate of lead is regenerated. This salt then contains three times more oxygen in the acid than there is in the base.

5. Finally, the examination of a metallic compound by means of the mode which I have pointed out, will always serve to verify an analysis, when we know the nature of the products which should result from different bodies submitted to the action of an aqua regia, formed from the peroxide of manganese and hydrochloric acid. Thus we know that sulphur is always found in the liquid as sulphuric acid, arsenic as arsenic acid, and iron as a peroxide, &c. The quantities of oxygen which each of the bodies should take in the reaction, ought to be equal to the number given in the analysis. The products of the arts produced by the treatment of metals extracted from their sulphurets, or arseniurets, often contain very variable combinations of the oxides with the sulphurets. The separation of the different elements of these bodies incompletely oxidized, present difficulties, and it is evident that the exact determination of the whole of the oxygen absorbed by the bodies in dissolving would afford a valuable datum in discussing the results obtained by analysis.

Annales des Mines.

ART. IX.—ON VINOUS FERMENTATION.

By M. CAGNIARD DE LATOUR.

IN the year 1799, the class of physical and mathematical science of the Institute proposed as the subject of a prize essay, the following question: What are the characters which distinguish, in animal and vegetable substances, the matters which excite fermentation from those which undergo this action. The prize was a medal of the value of a killogramme of gold, or little more than three thousand francs; this prize was renewed in 1800, but was withdrawn in 1802, in consequence of an unfortunate event which deprived the Institute of the funds out of which the expense of the prize was to be defrayed.

This question remained unanswered, although it may be considered as interesting at the present moment, as when the prize was proposed. Under the idea that the Institute had principally in view the most important fermentation, or that by which saccharine substances are converted into alcohol and carbonic acid, the vinous fermentation, I undertook a series of researches thereon, but by a different mode of proceeding than had yet been done,—that is to say, by studying the phenomena by the aid of the microscope.

It is known to chemists that when fresh yeast is mixed with a solution of sugar, and the mixture put into a vessel deprived of the access of air, and exposed to the temperature of about 80° F., in a short time the solution begins to ferment, and the process proceeds with greater or less rapidity according to the proportion of the yeast used; while under the same circumstances, the vinous fermentation does not take place but after a long time, when the solution does not contain yeast, and the saccharine solution is pure.

It is, therefore, proper to examine with the microscope, the matter which has the property of causing sugar to ferment; this examination, as will be seen by the letter which I had the honor to address to the Academy on the 27th of April, 1835,

has led me to perceive that the granules of which it is composed have a globular form, and to conclude that they are probably organized bodies.*

These bodies are in general simple, diaphanous, spherical or slightly oblong, and nearly colorless;—but with all the attention I have been able to bestow upon them I have not been able to perceive any motions which could be considered as external exertion of the will. On the other hand, the globules of the yeast, as I have frequently observed, may appear in a liquid where they could not be perceived previous to the vinous fermentation taking place. When bodies of a globular form, other than crystals, are produced in a mucous liquor and do not appear to be possessed of the power of locomotion, these bodies are commonly considered as vegetables.

We may then consider it as very probable that the globules of yeast are organized, and that they belong to the vegetable kingdom; these conjectures appear to be confirmed by several of the observations which will be noticed subsequently.

But these plants, if we can so call simple vesicles, are extremely small; for among the globules of different dimensions of which the yeast is composed, the diameter of those which appeared to have attained the final extent of their development, does not commonly surpass the one-hundredth of a millimetre; besides they are for the most part below this size,

* It is now more than twenty-five years since, being engaged in researches upon the best means of obtaining alcohol by the fermentation of different grains, I had the curiosity to examine the fresh yeast by means of the microscope. The instrument which I then used was very imperfect; I at that time thought that yeast resembled very fine sand composed of crystalline grains, but it is now evident that this was an error.

The principal microscopical observations indicated in the present paper, were made with a microscope constructed by M. Georges Oberhauser. The powers which I commonly used were three or four hundred diameters. To measure the size of the globules, I introduced into the instrument a micrometer, constructed by M. Charles Chevalier; I will add that this optician placed at my disposal one of Amici's microscopes, by which, in some instances, I was enabled to examine the globules with higher magnifying powers.

so that a cubic millimetre of yeast probably contains at least a million of these globules.

Presuming that the globules of the yeast should have the power of reproduction, I made several experiments to determine this point. The first, which were attempted on a small scale, failed, but this was not the case with two others which I made, one upon about ten heteroclites of the must of porter, which the kindness of M. Leperdriel afforded me the means, and the other upon a smaller quantity of the same must.

The results to which these trials have led, are: 1, that the globules of ferment, in consequence of the disengagement of gas which they cause, are carried to the surface, and that many of these globules remain entangled in the abundant froth produced by the fermentation; in which froth they may be readily distinguished by the microscope, by means of the brilliancy by which they are characterized; and 2, that the globules during their action upon the must of beer diminish in size, and by this contraction throw out seed or reproductive bodies, since new globules are soon perceived in the must, but with a faint or less visible appearance, although sufficiently large. The globules, which were not before visible, possess this peculiarity; they appear to have the power of reproduction, by buds or prolongations of their proper tissue, and thus to form connected globules, sometimes two, three, or even a greater number united together; a fact which seems to confirm my supposition, that the globules of yeast are organized and belong to the vegetable kingdom.

Considering it as very remarkable, that the globules of ferment should be deprived of the power of regeneration by the extension of their tissue, while younger individuals retained this faculty, I inquired of M. Turpin, whether he knew of any other microscopic bodies composed of isolated globules possessing analogous properties; by his answer it appeared that my observation was new.

Having examined with attention specimens of porter every hour, immediately on being drawn, from the vat, I perceived

at the end of the first hour after the addition of the yeast that the must already contained double globules; that is to say, upon each another smaller globule could be seen; that a little later this latter appeared to be enlarged, so that in many instances the two globules were of the same size; finally, the fourth specimen did not exhibit any double globules. I may add, that for the purpose of ascertaining whether the globules were connected, or only simply approximate, with a small needle I struck the glass containing the globules under the microscope, so as to produce considerable disturbance among the globules, but without breaking their connections; it however appears that these bodies on becoming older naturally lose their union, since in the ferment of commerce they are in general simple, as I have already remarked. This final disunion can hardly be attributed to any other than a vital action, distinct, it appears to me, from the idea that the formation of the globules are the result of crystallization, or of the coagulation of albumen; besides that in the course of the different fermentations which I have produced with the ferment of beer, it has happened that I could distinguish on certain globules many granules, and sometimes a round or oval spot, either central or lateral, which might be considered as a cicatrix or umbilicus formed by the disunion.

I suppose that ferment is of a vegetable nature, although containing azote, principally from this, that the globules have not the power of spontaneous movement. To this view it may be objected that some animals are deprived of such movements, and it is allowable to presume that among microscopic animalcules analogous bodies may be found, and that the globules are of this nature. But it appears to be more likely that ferment is of a vegetable nature, when we consider, 1, that this substance by its action upon sugar loses its azote, as was long since discovered by M. Thenard (*Ann. de Chim.*;) and 2, that all vegetables in a rudimentary state yield ammonia by distillation; besides that the azoted matter may be entirely separated and the vegetable tissue left behind, (*Mem. de M. Payen, Recueil des Savans Etrangers*, 1834.)

I have followed attentively the changes occurring in the juice of the gooseberry after it had been filtered and enclosed in a flask. I perceived in the liquid a few days after, many animalcules of some size, but which, although at first very active, became sluggish as soon as the vinous fermentation began, and soon disappeared, which is remote from the idea that the globules of ferment belong to the animal kingdom.

The globules of ferment are susceptible of the power of rapid development, for a little of the must from the vat of which I have spoken, on examination by the microscope eight hours after the addition of the yeast, already exhibited in the field of the instrument, armed with the power of three hundred diameters, from twenty-four to one hundred globules, while immediately after the introduction of the yeast there were but sixteen.

Likewise, on collecting the whole amount of the ferment which the vat of liquor could produce by the fermentation, the quantity was found to be very near seven times the weight of the ferment used; a fact which agrees very well with the results of my microscopic examination.

From the quickness with which the excess of the ferment was obtained, there is every reason to believe that this excess is due principally to the reproduction of the globules of ferment. Every brewer knows that the must of beer produces a greater weight of ferment than had been used, but this is supposed to be owing principally to the precipitation of vegetable albumen.

But while the must of beer is the means by which the globules of ferment may be very easily reproduced, it is not the same with simple solutions of sugar, for the ferment in acting upon these does not increase in weight, but on the contrary is well known to lose its activity.

To ascertain the cause of this deterioration, I examined with the microscope a ferment with which I had effected two successive fermentations of sugar in close vessels, and I perceived that the ferment which had but moderate powers contained a certain quantity of amorphous deposit, proceeding without

doubt from disorganized globules, and that the globules whose form could yet be distinguished, appeared somewhat dull and altered in shape. It appears, then, that if the ferment, after it has acted upon the sugar, is less active, although it has lost but little weight, it is because it contains fewer whole or living globules, from which it would seem probable that it is by some effect of their vegetation that the globules destroy the equilibrium of the constituents of the sugar, and thus gradually produce alcohol and carbonic acid; in addition to which it appears, that the globules are such as do not perish by being deprived of water, as ferment dried in the air does not for a long time lose its power of producing a good fermentation.

M. Gay Lussac, in an extract of his paper on fermentation, remarks on the subject of vinous fermentation, that it appears as yet to be one of the most mysterious operations of chemistry, the more especially as it will only act in succession, (*Ann. de Chim.*, 1810.) We may judge how just this reflection was, if, in consequence of my researches, we are led to conclude that vinous fermentation is the effect of the phenomena of vegetation.

This philosopher, also, has demonstrated that oxygen exercised a great influence upon the development of fermentation in certain liquids, especially the juice of the grape, but if this oxygen is necessary to its commencement, it is not to its continuance. From this discovery and other considerations, among which was, that that ferment of beer will produce fermentation in saccharine matters without the influence of oxygen, M. Gay Lussac gave the opinion that ferment may exist in a solid state in a great number of substances, but in a peculiar state differing from that of the ferment of beer.

With the view of having some knowledge of the nature of this difference, I made the following trial, the results of which, as we shall see, appear to demonstrate that the above opinion is well founded.

Thus, I kept, according to his process, for five days over mercury, the juice of the grape, which I had expressed for

this purpose, in a vessel filled with hydrogen gas. At the end of this time I examined by the microscope a portion of the deposit which the juice had thrown down, and found it almost amorphous—but upon making a similar examination, after by the introduction of oxygen into the vessel the vinous fermentation had been excited, I found in the deposit many globules. We would then be tempted to suspect—1, that the germs of these little vegetables form part of the matter of the sediment; 2, that there is no germination while they are enclosed in the grape; and 3, that this germination takes place when they are exposed to the action of oxygen gas, and it is by the commencement of their development that they become capable of acting like the yeast of beer.

On this occasion I remembered that M. Thenard, on filtering the juice of the gooseberry which he expressed from the fruit through a fine tissue, had collected on his filter a matter which contained very nearly the sixth of its weight of ferment, although it had been subjected to many washings before it was tried upon a solution of sugar; thus from this result, and those of my observations with the microscope upon ferments, there is no room to doubt, that the globules observed in the deposit from the juice of the grape, if not wholly, are in part formed with the elements contained in the matter of the deposit.

After what I have stated of the reproduction of the globules of ferment in the must of porter, it seems hardly to admit of doubt; nevertheless a learned physician has objected that, according to M. Milne Edwards, we can, by heating to a suitable degree the white of egg diluted with water, cause in this solution the appearance of globules, which did not before exist. It would then be allowable, he added, to suppose that ferment is an azotized matter formed by the coagulation of some vegeto-animal matter contained in the must of beer, and consequently that the globules obtained have no more vital organization than those obtained by the aid of white of egg and the action of heat.

To elucidate this subject, I placed on a sand bath, heated to

about 195° F., a capsule containing a mixture of 50 grammes of water, and one gramme of white of egg; as soon as part of the albumen was coagulated by the heat, I took away the capsule, and after it had cooled, I examined with the microscope a portion of the very thin pellicle which had formed on the surface of the liquid; I found that the pellicle did in fact contain a species of globules, of which the diameter might be about the hundredth of a millimetre; but they had in general something of a crystallized appearance, and on none of them could be distinguished either granules or umbilical spots. It appears to me, then, that the objection of which I have spoken is not sufficient to authorize the idea that the globules of ferment are analogous to those of the coagulated white of egg.

Likewise, I caused, in a closed vessel, the spontaneous fermentation of the must of porter; that is to say, without the addition of yeast. As would be expected according to the experiments of M. Thenard, this must, although it had been filtered, produced, by the vinous fermentation, a deposit of ferment; on examining with the microscope this deposit, I found it to be composed of globules analogous to those of common ferment. But this fermentation having proceeded more slowly than with the brewers, on the hypothesis that these globules are formed by a sort of albuminous coagulation, some ought to be very large, or at least slightly crystalline, like the globules of the white of egg, but this was not so; likewise it was observed that these globules were not generally as large as in common ferments, which is favorable to the supposition of an organization; for we may conceive that in a ferment by aid of a long time, the globules should be of very different ages.

I made the same experiment with a flask, previously filled with carbonic acid; the fermentation was developed a little more slowly, but otherwise the deposit obtained possessed the same microscopic appearances.

We know from Thenard, that juice of ripe fruits, and in general the liquors which undergo the vinous fermentation, throw down a deposit which has the same properties as ferment, (*Ann. de Chim.*) It is also known that a solution of

sugar with which the white of egg has been mixed, can, by a temperature of 95° F., sustained for some time, undergo the vinous fermentation and produce a deposit of yeast.

From these analogies, I supposed that similar deposits should afford under the microscope the same traces of organization as those of the ferment of beer; I consequently effected different fermentations in close vessels, especially on the juice of the gooseberry, of the grape, of the plum, as well as in a solution of sugar and white of egg, these liquids having been filtered previous to being introduced into their respective vessels; and on examining by the microscope the deposit obtained, I perceived that each of the deposits was composed in a large part * of globules analogous to the globules of the yeast of beer, results which agree in a remarkable manner with the observations of M. Thenard.

All those who are engaged in large fermentations, especially brewers and distillers of spirits from grain, know that in spite of all the care with which they carry on their operations, the results are extremely variable; these irregularities are also favorable to the hypothesis that the vinous fermentation is excited by bodies endowed with life, for we do not know in how many different manners such bodies may be affected.

We know from M. Thillorier, that the carbonic acid may become concrete by a certain degree of cold, and that in this state its temperature is inferior to that of frozen mercury. This skilful and ingenious experimenter had the kindness to place at my disposal some of the solid acid, which I mixed with the dry ferment reduced to fine powder. This ferment although it was thus exposed to a temperature excessively low,—that is to say, to 60° cent., and perhaps more, below zero,—was not the less fitted for the subsequent decomposition of sugar in as active a manner as before it was subjected to this cold.

* Independent of these globules, we can distinguish in certain deposits some other bodies; as, for example, crystals in the deposit furnished by grape juice, and shapeless flocculi in that produced by the experiment with albumen.

Since then I have frozen by a cold of 5° cent., fresh yeast mixed with a certain quantity of water, and afterwards ascertained that it could act upon saccharine solution like ordinary fresh yeast.

In conclusion, I may observe, that I have examined the principal works which treat of the vinous fermentation, in no one of which has it been proposed to employ the microscope to study the phenomena upon which it depends.*

This essay, as we may judge from the researches which it exhibits, was useful, since it has furnished many new observations, and from which it principally results—1, that the ferment of beer, a ferment of which so much use is made, and which for this reason it is proper to examine more particularly, is a collection of small globular bodies, susceptible of reproduction, consequently organized, and not a substance simply organic or chemical, as was supposed; 2, that these bodies appear to belong to the vegetable kingdom, and regenerate themselves in two different manners; and 3, that they appear to act upon a solution of sugar only while in a living state; from which we may conclude that it is very probably by some effects of their vegetation that they disengage carbonic acid from such solutions, and also convert them into spirituous liquors.

I may likewise remark, that ferment, considered as an organized matter, perhaps merits the attention of physiologists on these accounts—1, that it may be formed and develope itself under certain circumstances with great promptness, even in an atmosphere of carbonic acid, as in a brewer's vat; 2, that the mode of its regeneration presents peculiarities which have not yet been observed with regard to

* Leuwenhoek, in 1680, had already observed by the aid of the microscope that the yeast of beer contained globules, which he attributed to the farina employed for the formation of the must; but this observation, of which I had no knowledge previous to the presentation of my Memoir to the Academy, did not lead the author to the most important point, that these globules are capable of germinating and vegetating in the must of beer during its fermentation.

other microscopic productions of isolated globules; and 3, that it is not destroyed by a very considerable degree of cold or by being deprived of water.

Finally, I may consider that the question formerly proposed by the Institute, appears to be resolved by the results given, for they lead to the conclusion that generally the ferments, and especially those which produce the vinous fermentation, are composed of very simple, organized, microscopic bodies, and that the substances subjected to their action are purely chemical, such as sugar and analogous compounds.

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ART. X.—OBSERVATIONS UPON BLAUD'S PILLS.

By M. GUIBOURT.

THE following observations have originated from reading several articles published in the *Journal de Pharmacie du Medi*, and it appears to me, that as pharmaciens so little concur in the preparation and composition of Blaud's pills, it will not be useless to call their attention to this medicine, the base of which is a substance much employed in modern therapeutics.

The following is the formula of Dr. Blaud, as reported in the *Bulletin de l'Academie Royale de Medicine*, tom. 1, p. 92.

R.—Sulphate of iron,
Subcarbonate of potassa, aa ʒiv.

Reduce the two substances separately to a very fine powder; mix them intimately, and add

Mucilage of gum tragacanth, q. s.

Beat well together, and form a mass, which divide into forty-eight pills.

In order to avoid any doubt, let us, in the first instance, notice the materials.

Sulphate of Iron.—Evidently it is meant the *green vitriol* of the older chemists. It is necessary to choose it in handsome crystals, transparent, of a pale or emerald green color, free from copper, and completely at the minimum of oxidation. Its formula is $\ddot{\text{S}}\text{Fe} + 6\text{OH}_2$, and its atomic equivalent = 1615.24.

Subcarbonate of Potassa.—This is the neutral carbonate of chemists, ($\ddot{\text{C}}\ddot{\text{K}}$), its atomic weight is 866.35. But this salt is found in the shops in several states, and it is important to fix upon that which should be employed. In one of these states it is very impure, forming the potash of commerce; and although the new Codex authorizes its employment, in the place of the true carbonate of potassa, containing, as it does, chloride of potassium and sulphate of potassa, still it cannot be imagined that this saline compound should be used in preparing Blaud's pills. Let us look a little farther for the article. There is found in the shops what is called *Salt of Tartar*, obtained by calcining cremor tartar, and lixiviating the product. This salt when dried presents the pure carbonate of potassa, and is such as is required in the formation of the pills; but what is at present found in commerce under the name of salt of tartar, is nothing more than impure potash dissolved in water and dried. A similar article which I examined was composed of

Carbonate of potassa	38.8
Chloride of potassium	} 49.2
Sulphate of potassa	
Water	12.0
	<hr/>
	100.0

This certainly is not fit for the purpose.

It is easy for pharmaciens to obtain a carbonate of potassa almost pure, by following the method given in the *Pharmacopée Raisonnée*, tom. 2, p. 406. The best potash is to be dissolved in three-fourths or half its weight of distilled water. After twenty-four hours, it is filtered through double paper,

the solution is evaporated to dryness and the carbonate is then heated to redness. This salt is appreciably pure, and should be employed in all pharmaceutic operations, into which the carbonate of potassa enters in fixed and determinate quantity. We should state, however, that when this salt is kept for a long time, although in close vessels, it absorbs water, of which from 13 to 15 centièmes are taken up before it appears to be moist. This water produces no change in the the pills of Blaud, on account of the excess of alkaline carbonate still remaining, but if the same quantity of carbonate be always employed, it is better to take that which has been recently calcined. These preliminaries established, let us proceed to the preparation of the pills.

It is useless to reduce the two salts separately to fine powder, and to mix them by little and little as directed by Dr. Blaud. They can be triturated together in an iron mortar, but they rapidly become moist, and even liquefy, in consequence of the solution of the carbonate of potassa in the water of crystallization of the sulphate of iron. It is necessary only to triturate them until the white particles are no longer seen upon the pestle, after which there are several methods of finishing the pills. First, this may be done without any addition; the trituration is continued for some time and the mass liquefies; then it thickens, and appears ready to solidify, when it should be quickly taken out of the mortar and divided into pills, which is easily accomplished if there be no delay in the operation; if there be, the mass can neither be divided or rolled. To remedy this inconvenience, it is again rubbed in the mortar with a few drops of water; it then resumes the proper consistence, and retains it a sufficient length of time to perform the manipulations.

The pills thus prepared, often exhibit a peculiar phenomenon depending upon the second effect of the carbonate of potassa upon the sulphate of iron, (the first is to abstract the water of crystallization of the sulphate,) which is due to the formation of a sulphate of potassa and a carbonate of the protoxide

of iron. The latter is suroxidated by the atmosphere, loses its carbonic acid, and passes to the state of the hydrated peroxide. Now, in the pills prepared without addition, there is no mucilage to resist the action of the air and prevent the disengagement of carbonic acid; and both effects speedily take place. The pills become red on the succeeding day, swell and become powdery by handling. This state may still be remedied by rubbing the mass anew in a mortar, either alone or with a few drops of water, and re-forming the pills, which then are preserved in the air without any apparent new alteration.

If, instead of making the pills without addition, it is desired to render them cohesive by means of gum tragacanth, the moment is seized when the mixture of the two salts appears to be complete, and half a drachm of pulverized gum tragacanth is added; if the mass be withdrawn when it begins to thicken, it hardens so rapidly that it is impossible to finish the pills before they become friable. It is better, therefore, to allow it to harden in the mortar, and to give to it the requisite soft consistence with a little water, which is retained sufficiently long to make it into pills.

If, instead of gum tragacanth, a drachm of gum arabic be employed, the mass assumes a good consistence, and may easily be rolled. But however favorable circumstances may be for the manipulation, it is rarely that it can be terminated as it is begun: the last made pills become dry and friable, and if a little water be added, the mass assumes an elastic mucilagenous consistence which opposes the formation of pills.

By employing amidon instead of gum tragacanth, the mass instantaneously hardens, becomes friable, and cannot be moulded between the fingers.

Powdered marsh mallows would be well calculated to give consistence to Blaud's pills, if it did not give rise to a particular inconvenience arising from the nature of the substance. The mass remains soft and cohesive sufficiently long to divide into pills; but they exhale an ammoniacal and very disagreeable odor, produced by the reaction between the carbonate of

potassa and the *altheine* of the marsh mallows. This renders it objectionable.

To recapitulate. The best mode of making Blaud's pills consists in pulverizing the two salts together in an iron mortar, beating them until they shall be completely divided and mixed, adding to them half a drachm of gum tragacanth, and allowing the mass to solidify. Then the necessary quantity of water is added to give to it the suitable consistence to be divided into pills. But we may remark, that the pills as directed by Dr. Blaud, weigh more than 12 grains, and that their size is an objection to their administration. I think that they ought to be reduced to half the volume, that is to say, make 96 instead of 48. Two may then be taken in place of one.

M. Soubeiran, in his *Traité de Pharmacie*, has modified Blaud's formula in the way I have proposed, but I do not understand the object of assuming the number directed. His formula is: one ounce and seven drachms, or fifteen drachms of each of the salts, and a drachm of gum arabic, divided into 298 pills. According to Dr. Blaud, this mass should furnish 180 pills; in my opinion 360; the medium number will be 270. I cannot see the reason for adopting so irregular a number as 298.

I shall make another charge against M. Soubeiran; it is of having stated that Blaud's pills contain an excess of sulphate of iron which is not decomposed by trituration, and of having supposed, as a consequence, that there was formed a double sulphate of potassa and peroxide of iron. There can be no doubt as regards the carbonate of potassa employed, as M. Soubeiran directs the *dry* salt.

Now, as I have previously shown, the atomic weights of the crystallized sulphate of iron, and dry carbonate of potassa, being respectively 1615 and 866, it follows that 866 parts of the last are sufficient to decompose completely 1615 of the other, and that when equal parts are employed, there remains almost half of the carbonate in excess. To be more exact: of the four drachms of carbonate in the formula of Dr. Blaud,

there remains 133 grains, or 2.8 grains per pill, if there be made 48 of them, and 1.4 grains if the mass be divided into 96 parts, as I have proposed.

It is, moreover, easy to be convinced that a large excess of carbonate of potassa exists by dissolving a few of the pills, and filtering the liquid. This offers an alkaline reaction, and effervesces briskly with the acids. It is entirely colorless, and does not retain in solution an atom of iron, the metal being found in the precipitate in the state of carbonate or hydrated oxide. So that the following is the true composition of Blaud's pills.

They contain,—

Sulphate of potassa,

Carbonate of potassa,

Hydrated carbonate of iron, more or less suroxidated and decomposed.

The use of these pills differs from that of the *hydrate of iron*, prescribed by physicians generally, under the name of *subcarbonate of iron*, not only in consequence of the presence of sulphate of potassa, as is supposed by some persons, but also of carbonate of potassa; and because the iron is preserved for a long time in the pills in a lower state of oxidation, and partly in the state of a carbonate, which, in fact, renders it more readily absorbed.

Since this medicine has been employed, many practitioners have substituted in their prescriptions the bicarbonate of potassa, for the simple carbonate; and I have not hesitated to direct this formula in my *Pharmacopée Raisonnée*, tom 1, p. 383, because, in fact, it presents greater advantages than the other.

1. By the avoidance of a very alkaline salt, an excess of which may not prove beneficial to the stomach.

2. By the formation of a double carbonate of potassa and iron, which is, of all the compounds of iron, the most fitted for absorption by the economy, for it is not only soluble, but not astringent.

The following is the formula, which is of convenient execution:—

Pills of carbonate of iron and potassa.

- R.**—Pure crystallized sulphate of iron,
Crystallized bicarbonate of potassa, $\frac{aa}{3}$ ʒiv.
Powdered gum arabic, ʒi.
Powdered marsh mallows, ʒss.

M.—Divide into 96 pills.

The two salts are triturated together in an iron mortar. They at first are rendered slightly moist, but soon after become dry. If the gum arabic be then added, the mixture is liquefied, which effect is due to the attraction of the gum arabic for the water of crystallization of the two salts, it forms a liquid solution, in which the salts are held. The marsh mallows produces the same result, but in a less marked manner; its addition is with the design of giving greater consistence to the mass. In this case, it is not subject to the same objection as in the former, where the carbonate of potassa decomposes the altheine of the marsh mallows. Here no such effect ensues, for no ammoniacal odor is disengaged. The mass becomes homogeneous and cohesive, preserving its softness a sufficient length of time for its division into 96 pills, and the dessiccation of the undivided mass, moreover, can be prevented by covering it with a cup, the interior of which has been moistened. These pills contain a slight excess of bicarbonate of potassa, (about half a grain per pill,) which constitutes with a corresponding proportion of carbonate of iron, a double salt soluble in water. The remainder is composed as in Blaud's pills, of subcarbonate, or hydrate of iron, and sulphate of potassa.

L' Experience.

ART. XI.—PRODUCTS RESULTING FROM THE ACTION OF
NITRIC ACID UPON AMIDINE. By M. PELOUZE.

M. BRACONNOT, some years since, made known an action of concentrated nitric acid, by which many substances, especially amidine and lignin, are converted into a new matter, which he denominated xyloïdine; but the composition of this substance, and the circumstances accompanying its formation, were not examined. The present paper has for its object the elucidation, in part, of these points.

If nitric acid, of the specific gravity of 1.5, be mixed with, or poured upon amidine, this latter disappears completely in the course of a few minutes; the solution, treated with water, lets fall the whole xyloïdine, and after filtration and evaporation, leaves scarcely any residue.

If, instead of producing the precipitate by means of water, immediately after the amidine is dissolved, the liquid is set aside in a closed vessel, it becomes gradually colored, and assumes the various tints of a mixture of nitric acid and deutoxide of nitrogen. Water forms with it a precipitate, which diminishes with the increase of time; at the end of two days, and sometimes even in a few hours, the liquid ceases entirely to become even cloudy; the xyloïdine has been destroyed, and converted completely into a new acid, which, by evaporation, is presented under the form of a solid, white mass, uncrystallizable and deliquescent, and of which the weight is much greater than that of the amidine submitted to the experiment. Moreover, neither carbonic or oxalic acid is produced during this reaction.

The xyloïdine, the first product of the action of nitric acid upon amidine, is the result of the union of the two substances. It is common amidine in which one atom of water is replaced by one atom of nitric acid. The whole amidine is changed into this substance, which perfectly explains the considerable augmentation of weight observed when the xyloïdine is precipitated by water immediately after the amidine has disapp-

peared in the nitric acid. Since an excess of this acid converts the xyloïdine into a very soluble matter, which is nothing else than the new acid indicated above; this, likewise explains the different result obtained by M. Bracconot, who procured a weight of xyloïdine equal to the weight of the amidine employed. This is evidently owing to the fact that part of the former substance had been already decomposed. By delaying still more the precipitation, he would soon have been convinced of the impossibility of obtaining the slightest trace of xyloïdine.

When, instead of setting aside at ordinary temperatures, the mixture of amidine and concentrated nitric acid, the mixture is caused to boil, the amidine is decomposed in a few minutes, and converted into a deliquescent acid, which may be easily obtained pure, and in large quantity, by evaporation on a salt water bath. This acid does not contain azote; it has some resemblance to oxalhydric acid, but differs in its composition. A moderate heat converts it into another acid of a black color, soluble in water, and capable of reproducing, under the action of nitric acid, the white acid from which it is derived.

Boiling concentrated nitric acid attacks it with great difficulty. In the cold, it changes it slowly into oxalic acid, without any production of carbonic acid. Thus, by slow oxidation, determined by the presence of a suitable quantity of concentrated nitric acid, the amidine is changed successively into xyloïdine, a deliquescent acid, and into oxalic acid, without the carbon participating in the displacement of the other elements of these matters. These curious reactions take place of themselves in closed vessels.

We have said that the xyloïdine results from the combination of amidine with the elements of nitric acid. It is a salt in which amidine fulfils in relation to the nitric acid the part of a base; thus, it is very combustible at the temperature of 180° c. It takes fire, consumes without residue, and with much quickness. This property has led to an experiment which may be susceptible of some applications, especially in

artillery. On plunging paper in nitric acid of the specific gravity of 1.5, leaving it there sufficiently long to become saturated, in general two or three minutes, taking it out and washing in a large quantity of water, a kind of paper is obtained impermeable to moisture, and of extreme combustibility. The same takes place in fabrics of linen and cotton.

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ART. XII.—NECROLOGICAL NOTICE OF M. DULONG.

By A. F. BOUTRON-CHALARD.

SCIENCE has sustained a loss by the decease of a man the most remarkable for the extent of his knowledge, his extreme modesty, and the brilliant qualities of his heart. M. Dulong, born at Rouen, the 12th of February, 1785, died, after a long illness, the 19th of July last. Devoted to science from his youth, at the age of sixteen years he entered the Polytechnic school; afterwards he studied medicine, and practised in Paris for some time, but finally abandoned the profession to devote himself to a series of labors, which attest the great profundity of his views, and the capacity of his mind. In 1811, when scarcely twenty-six years of age, he engaged in that series of experiments upon the chloride of nitrogen, during which he had the misfortune to loose an eye and three fingers; experiments which he recommenced as soon as recovery took place, and previous to making known this dangerous compound to the scientific world.

The researches which M. Dulong has published upon the mutual decomposition of soluble and insoluble salts; his excellent paper upon the combinations of phosphorus and oxygen; his observations upon some of the combinations of oxygen and nitrogen; those upon oxalic acid and the oxalates; the labor which he performed with Berzelius in 1819, at the time of the journey of the latter to Paris, which had for its

object the new determinations of the proportions of water and the density of some elastic fluids; finally, that in conjunction with M. Thenard, relative to the property which certain metals possess to facilitate the union of certain gases, which had for its aim the verifications of the excellent experiments of Dœbereiner upon the inflammation of hydrogen by platinum sponge, will always deserve the esteem and remembrance of chemists.

The students of physical science have, perhaps, even more obligations to him, for the excellent researches which he undertook, along with M. Petit, upon the laws of the dilatation of solids, liquids, and elastic fluids, and upon the exact measure of temperature; as well as for those upon the specific heat of bodies, which have rendered it certain that the atoms of simple bodies have always an equal specific heat, whatsoever may be their chemical nature, and which have determined that this equality is so exact, that by determining the specific heat of one body, we may from thence determine, numerically, the specific heats of all other simple bodies, as well as their chemical combinations, by means of their atomic weight. An ingenious and fruitful idea, which has caused great progress in the study of the atomic theory.

Finally, that excellent work which he undertook, together with M. Arago, in 1829, upon the relation between the temperature and pressure of vapor in boilers, will always remain as a model of precision and exactness in science.

A man endowed with such great sagacity, and such solid attainments, could not long remain unknown to the learned of Europe.

In 1815, when thirty years of age, he was the competitor of M. Girard for the vacancy in the section of general physic, caused by the death of M. Levêque, but was foiled in the contest! In 1823, when Fourier was named perpetual secretary, in the place of M. Delambre, M. Dulong was nominated his successor, and has since preserved in the Academy that influence which unpretending knowledge and a benevolent character always gives. Successively, professor in the school of Alfort,

adjunct to M. Thenard in the Faculty of Sciences, then professor of Physics. He was nominated director of the studies of the Polytechnic school, when the revolution of 1830 took place, and we may add, that the situation was never more worthily filled. Affable, kind, indulgent, though firm, to the students, they became accustomed to regard him as a father, and he, in return, loved them as his children. In 1832, when Cuvier was elected to the Academy of Sciences, of which he was one of the brightest ornaments, M. Dulong, by the spontaneous, and almost unanimous voice of his colleagues, was called to succeed him as perpetual secretary of the physical sciences; but his numerous duties, and delicate health, did not long permit him to retain these honorable stations. Simple in his tastes and habits, his life was passed in the bosom of his amiable family, and some devoted friends; and music, at intervals, was the only recreation which he allowed himself in the midst of his important labors. Disinterested, prodigal of his councils to young men, thoughtless of self, M. Dulong was the type of a true philosopher, and his death left the most profound regrets in the memory of all who knew him. In him the society and science lost, at the same time, a noble heart and fine talent.

Journal de Pharmacie.

ART. XIII.—PATENT MEDICINES. By C. ELLIS.

THERE are few numbers of this Journal that have been more sought after, or that have contained matter more practically useful to a large number of its patrons, than that published in 1833, (No. I., Vol. V., p. 20,) containing the formulæ for Patent Medicines, as revised by a Committee of the Philadelphia College of Pharmacy, and adopted by that Institution in 1824.

There are many of the present subscribers who have not complete sets of the work, a large number, indeed, who were not subscribers to the old series, which has induced the belief that the republication of these recipes now, with the addition of a few others, might prove acceptable.

The Committee of the College of Pharmacy, to whom was intrusted the task of revision, found the greatest dissimilarity in the formulæ in use. They state in their report, that “in some of the recipes for the same medicine, there are not two articles alike, and the quantity of opium in Bateman’s drops varies from one to nearly fourteen parts in a thousand parts of liquid.”

“These variations have crept in, no doubt, partly through errors in transcribing the recipes, partly through imitations of the original medicine, made to answer the intention, and resemble it in taste and appearance, and partly through attempts at reformation, made from a conviction of the want of authenticity in the recipes in use.”

The Committee further state, “that they have attempted a reform in these medicines, according to the following views:

“1st. To form a medicine possessing the chief compatible virtues ascribed to it in the usually accompanying directions.

“2d. To approach as near as is consistent with this design to the recipes in common use, rejecting inert and superfluous articles.

“3d. To make the strength of the medicine correspond with the doses ordered in the directions.

“4th. To direct in their composition articles which are easily procured genuine, and of a price such as not to hold out a temptation to alter or adulterate the medicine.”

The attention of the Committee was confined to the first eight recipes which follow: that for Balsam of Honey not being among the number, was subsequently added to them by the New York College of Pharmacy, and was also published in this Journal, (Vol. VI., p. 61.)

1. *Hooper's Female Pills.*

These pills were originally designed, and are constantly used as cathartic and emmenagogue. The different recipes vary so much that aloes is the only article contained in them all. The committee have selected the Extract of Hellebore, the Sulphate of Iron and the Myrrh, as the best emmenagogues; Aloes as the cathartic basis, Ginger and Canella alba as aromatic correctives, and Soap as an adjuvant, and affording an eligible form. The fetid gums which are contained in many of the recipes are rejected as being antispasmodic rather than emmenagogue; the Extract of Savin as difficult to procure, and as necessarily injured in its preparation; the Ivory black as a clumsy and barbarous ingredient; and the remaining articles in the tables, as either inert or superfluous. The following recipe is submitted for the consideration of the trustees:

RECIPE.

Aloes Barbadosis,	℥viij.	400
Ferri Sulphatis Exsiccati,	℥ii.	3iss.
<i>Vel</i> Ferri Sulphatis crystal,	℥iv.	200
Extracti Hellebori Nigri,	℥ij.	100
Myrrhæ,	℥ij.	100
Saponis,	℥ij.	100
Canellæ in pulverem tritæ,	℥j.	50
Zingiberis in pulverem tritæ,	℥j.	50

1000 parts.

Beat them well together into a mass with water, and divide into pills, each containing two and a half grains.

2. *Anderson's Scot's Pills.*

These pills are a mild aloetic purgative, with which, according to the judgment or fancy of the preparer, various adjuvants are combined. The formula submitted by the committee will, it is presumed, be liable to as few objections as any.

RECIPE.

Aloes Barbadosis,	℥xxiv.	787
Saponis,	℥iv.	131
Colocynthis,	℥j.	33
Gambogiæ,	℥j.	33
Olei Anisi,	f.℥ss.	16

1000 parts.

Let the aloes, colocynth and gamboge be reduced to a very fine powder, then beat them and the soap with water, into a mass, of a proper consistence to divide into pills, each containing three grains.

3. *Bateman's Pectoral Drops.*

More important errors have crept into this recipe than into any other. The quantity of Opium in one formula is $7\frac{1}{2}$ grs. and in another 106 grs. to the pint. The Camphor varies still more. Castor is introduced into many of the recipes in place of Catechu, which appears to have been an original ingredient. and which it in no way resembles. The intention seems to have been to form a narcotic and astringent, possessed of diaphoretic and diuretic qualities. Such an intention will at least best answer the purposes for which the medicine is now used, and for which it is chiefly recommended in the printed directions. The formula submitted by the committee, contains half a drachm each, of opium, camphor and catechu in a pint, or about a grain of each in half a fluid ounce of the liquid. It contains an equal quantity of opium, with the elixir pare-

goric or opiated tincture of camphor of the American Pharmacopœia.

RECIPE.

Alcoholis diluti,	Cong. iv.	1000 parts.
Santali Rubri Rasi,	℥ij.	31.25
Digest for 24 hours, filter and add		
*Pulveris Opii,	℥ij.	31.25
Pulveris Catechu,	℥ij.	31.25
Camphoræ,	℥ij.	31.25
Olei Anisi,	f.℥iv.	7.81
Digest for ten days.†		

4. *Godfrey's Cordial.*

The quantity of opium in this mild and much used narcotic varies in a very dangerous degree. Some of the recipes contain 4.46 parts, and others only .92 parts of opium in 1000 parts of the liquid. The printed directions state that a large tea-spoonful is the dose for a child one year old. Supposing the proper dose of opium for such a child to be the twelfth part of a grain, the quantity contained in 1000 parts of the liquid would be 1.39. As this is, however, much below the average quantity in the recipes, the committee have adopted the proportion of 2.08 to 1000; according to which a grain of opium is contained in an ounce, or two table-spoonsful of the liquid, which is the dose for an adult ordered in the printed directions. The salt of tartar, which is found to be very useful as an anti-acid, is retained in the proportion of one and two-thirds of a grain to the ounce; and the oil of sassafras is

*Vel tincturæ opii Oij et alcoholis diluti cong. iij Ovj.

† In the original preparation, the undissolved residuum was kept agitated in the mixture while bottling off, so as to form a sediment in each bottle. The virtues of the opium and catechu are entirely extracted by proof spirit, and the circumstance is merely mentioned that those who wish may preserve the appearance of the original. The coloring used for the artificial brandies may be substituted with advantage for the red saunders in the proportion of three ounces to the gallon.

adopted as being the carminative which has become one of the chief features in the medicine. The molasses should be that of the sugar refiners, and the composition should contain enough of it to resist fermentation.

The following formula, adopted with those views, is submitted:—

RECIPE.

Tincturæ Opii,	Oiss.	34.5	} 1000 parts,
Syrupi Nigri,	Oxvj.	367.8	
Alcoholis,	Oij.	46.	
Aquæ,	Oxxvj.	551.7	
Potassæ Carbonatis,	ʒiiss.	57.5	
Olei Sassafras,	f. ʒiv.	11.5	

Dissolve the salt of tartar in the water, add the molasses, and heat over a gentle fire till they simmer; take off the scum which rises, and add the laudanum and oil of sassafras, having previously mixed them well together.

5. *Dalby's Carminative.*

The printed directions for this mild carminative and laxative, order it in doses of a tea-spoonful for children, of from one to two years old, and of two table-spoonsful for an adult. These doses indicate the proportion of opium to be about a grain to the ounce, which the committee have accordingly adopted. The formula proposed by them contains also thirty-three grains of magnesia, and one and a half grains of salt of tartar to the ounce. This composition they think is well adapted to the doses, and for the diseases mentioned in the printed directions. The combination of essential oils which they have proposed, forms a milder and more grateful carminative than the same quantity of either taken alone. Several of the recipes contain the tincture of castor and assafoetida, which are no doubt occasionally useful, in the cases in which this medicine is prescribed. Both on account of their nauseous taste, and because the intention in this preparation seems to have been to form a carminative, rather than an antispasmodic,

we have omitted these tinctures. The following formula is proposed by the committee:—

RECIPE.

Aquæ,	Ox.	1000 parts.
Sacchari Albi,	℥xxxij.	200
Potassæ Carbonatis,	℥ss.	3.125
Magnesiae Carbonatis,	℥xij.	75.
Tincturæ Opii,	f. ℥vi.	37.5
Olei Menthæ Piperitis, f.	℥ij.	.5
Olei Carui,	f. ℥ij.	.5
Olei Anethi Fœniculi, f.	℥ij.	.5

Triturate the essential oils with the sugar and magnesia, and then add the remainder.

6. *Turlington's Balsam of Life.*

The committee have taken, as the basis of their formula, the compound tincture of benzoin of the pharmacopœias, to which they have added balsam of Peru, myrrh, and angelica root. The following recipe affords, they think, an elegant and rich balsamic tincture:—

RECIPE.

Alcoholis,	Ovij.	1000 parts.
Benzoini,	℥xij.	93.75
Styracis Liquid,	℥iv.	31.25
Aloes Socotrinæ,	℥j.	7.8125
Balsam. Peruviani,	℥ij.	15.625
Myrrhæ,	℥j.	7.8125
Radicis Angelicæ,	℥ss.	3.90625
Balsam. Tolutani,	℥iv.	31.25
Extracti Glycyrrhizæ,	℥iv.	31.25

Digest for ten days, and strain.

7. *Steer's Opodeldoc.*

The committee have adopted, with slight variations, the linimentum saponis of the old London dispensatory. They

have added Aqua ammonia, which is contained in several of the recipes in the table, and is an excellent addition; and have substituted for the oil of Origanum the essential oil of the *Monarda punctata* a native plant nearly resembling it in odor, though more stimulating, and more readily to be procured genuine. In preparing this tincture, it is necessary to use soaps made with animal fats, if we wish the preparation to remain solid. The soaps made with vegetable oils, form solutions in alcohol that remain liquid at the common temperature.

RECIPE.

Alcoholis,	Oviij.	1000 parts.
Saponis Albi,	℥xx.	156.25
Aquæ Ammoniæ,	f. ℥iv.	31.25
Camphoræ,	℥viiij.	62.5
Olei Rosmarini,	f. ℥j.	7.8125
Olei Monardæ,	f. ℥j.	7.8125

Dissolve the soap in the alcohol with a gentle heat, add the remaining articles, suffer the impurities to subside, and pour off into vials while warm.

8. *British Oil.*

For the preparation of this patent medicine, there are in use two distinct classes of recipes, one having oil of turpentine and the other flaxseed oil or spermaceti oil as the basis. The character of the medicine as exhibited in the directions, and the uses to which it is now applied, would seem to require a preparation selected from both classes. With this view the following formula is adopted; omitting the *oil of bricks*, a nauseous and unskilful preparation, which has long been banished from the pharmacopœias, although contained in most of the recipes, and introducing Seneca oil in its place. As there appears to be no good reason for retaining it, the spermaceti oil is also rejected.

RECIPE.

Olei Terebinthinæ,	f. ℥viiij.	326.05
Olei Lina Usitatissimi,	f. ℥viiij.	326.05
Olei Succini,	f. ℥iv.	163.25
Olei Juniperis,	f. ℥iv.	20.46
Petrolei Barbadensis,	f. ℥iiij.	122.47
Petrolei Amer. (Seneca oil,)	f. ℥j.	40.82

1000.00 parts.

Mix them well together.

9. *Lee's Windham Antibilious Pills.*

RECIPE.

Pulv. Gum Gambogia,	℥iiij.
“ Aloes Socot.,	℥ij.
Sapon. Alb. Hispan.,	℥j.
Pulv. Potas. Nit.,	℥ss.
Extract Cow Parsnip,	℥j.

Mft. mass. sec. artem., cum. alcohol, q. s.


Divide into pills of five grains each.

10. *Lee's New London Antibilious Pills.*

RECIPE.

Pulv. Aloes Socot.,	℥xij.
“ Scammon. Aleppo,	℥vj.
“ Gambogia,	℥iv.
“ Jalap,	℥iiij.
“ Calomel, ppt.,	℥v.
“ Sapon. Castil.,	℥j.
Syrup of Buckthorn,	℥j.
Mucilag. Gum Arabic,	℥vij.

M. When well incorporated, divide ℥ij. of the mass into twenty-four pills.

 In this report the weights, measures, and preparations of the American Pharmacopœia are adopted as the standard.

MINUTES OF THE PHILADELPHIA COLLEGE OF
PHARMACY.

Stated meeting held September 24th, 1838.

Present, twelve members. HENRY TROTH, Vice President, in the chair.

THOMAS P. JAMES was duly elected a resident member of the College.

The following communication, from EDWARD B. GARRIGUES, was read, and accepted.

"To the President and Members of the Philadelphia College of Pharmacy.

Having relinquished the Drug Business, with no prospect of again entering it, I have concluded to resign my right of membership in the College; you will therefore please accept this as my resignation, with my best wishes for your prosperity, collectively and individually.

I remain your friend,

EDWARD B. GARRIGUES."

A statement of the accounts of the late Treasurer, was also presented and approved. On motion,

Resolved, That the thanks of the College be presented to EDWARD B. GARRIGUES, late Treasurer of the Institution, for his long continued and faithful discharge of the duties of that office: and that the rules, requiring a surrender of the certificate of membership, be suspended in his case, and that he be requested to retain the same as a voluntary evidence on the part of this College, of the high sense they entertain of his exertions as an officer and member, to promote the interests of the Institution during his connection with it.

Resolved, That the Secretary be directed to communicate to him a copy of these resolutions.

Resignations of the right of membership in the Philadelphia College of Pharmacy, were read and accepted on the usual terms, from the following gentlemen, viz.: CHRISTOPHER MARSHALL and ISAAC THOMPSON.

This being the evening for the semi-annual election for Trustees, and there being a vacancy in the office of Treasurer, by the resignation of E. B. GARRIGUES, the following gentlemen were chosen:

Trustees.

PETER LEHMAN,	Dr. F. BACHE,
WM. W. MOORE,	JOHN WETHERILL,
JOHN C. LEHMAN,	CLEMENT CRESSON,
JACOB BIGONET,	WM. HODGSON, Jr.

Treasurer.

SAMUEL F. TROTH.

It was moved and seconded, that the names of WM. BAKER, and GEORGE GATCHELL, being largely in arrears to the College, and refusing to pay their subscriptions, and having neglected the attendance of its meetings for several years, be stricken from the roll of members.

Adopted *nem. con.*

March 25th, 1839.—Present, HENRY TROTH, PETER LEHMAN, CHARLES ELLIS, SAMUEL F. TROTH, DILLWYN PARRISH, RICHARD M. REEVE, WM. W. MOORE, HENRY W. WORTHINGTON, THOMAS P. JAMES, EDWIN A. HOSKINS.

HENRY TROTH, Vice President, in the chair.

The following gentlemen were duly elected resident members of the Philadelphia College of Pharmacy, viz.: Dr. ROBERT BRIDGES, RICHARD W. TEST, and JOHN GILBERT. HENRY W. WORTHINGTON, a graduate in Pharmacy, was also elected a resident member, at a meeting of the Board of Trustees.

The annual Report of the Publishing Committee of the American Journal of Pharmacy was read and adopted. They state that the work gives general satisfaction to its readers, and that its continuance, in their opinion, is essential to the best interests of Pharmacy in this country. That the Journal is prosperous in its financial condition, but if the gentlemen,

more generally, who are engaged in the drug business, were to subscribe with the same liberal feelings that a large number of them do, the work might be embellished and rendered still more useful and interesting than it is.

This being the evening for the annual election, the following Officers, Trustees, &c., were duly elected, viz.:

President.

DANIEL B. SMITH.

1st Vice President—HENRY TROTH.

2d Vice President—DR. GEORGE B. WOOD.

Secretary—CHARLES ELLIS.

Corresponding Secretary—ELIAS DURAND.

Treasurer—SAMUEL F. TROTH.

Trustees.

WARDER MORRIS,	DR. JOSEPH CARSON,
EDWARD ROBERTS,	THOMAS H. POWERS,
RICHARD PRICE,	DILLWYN PARRISH,
EDWARD C. MARSHALL,	RICHARD M. REEVE.

Publishing Committee.

DANIEL B. SMITH,	DR. JOSEPH CARSON,
CHARLES ELLIS,	JOHN C. ALLEN,
DR. GEORGE B. WOOD,	DILLWYN PARRISH,
DR. FRANKLIN BACHE,	WILLIAM HODGSON, JR.,
DR. ROBERT BRIDGES,	ELIAS DURAND.

Extracted from the minutes.

CHARLES ELLIS, *Secretary.*

At a commencement of the Philadelphia College of Pharmacy held at the Hall, April 23d, 1839, the degree of graduate of pharmacy was conferred on the following gentlemen:

THOMAS W. HARRIS,	<i>Analysis of Mineral Waters,</i>
ROBERT B. POTTS,	<i>Capsicum Annuum.</i>
RICHARD RUSHTON,	<i>Asarum Canadense.</i>
HENRY W. WORTHINGTON,	<i>Veratrum Viride.</i>
HENRY BROOKS,	<i>Ipomea Jalapa.</i>
CLAUDIUS B. LINN,	<i>Aralia Nudicaulis.</i>
A. DICKENSON WOODRUFF,	<i>Kino.</i>
CHARLES WILLIS SIMONS,	<i>Eupatorium Perfoliatum.</i>
WILLIAM EDWIN KNIGHT,	<i>Chrysanthemum Parthenium.</i>
THOMAS C. HOPKINS,	<i>Delphinium Consolida.</i>
WALTER SHINN,	<i>Convolvulus Panduratus.</i>
THOMAS HAINES,	<i>False Article of Drymis Winteri.</i>

An address was delivered by Dr. CARSON, Professor of Materia Medica.

CHARLES ELLIS, *Secretary.*

MINUTES OF THE NEW YORK COLLEGE OF PHARMACY.

At a meeting of the College, held March 21st, 1839, the following gentlemen were elected officers of the Institution for the ensuing year:

President.

CONSTANTINE ADAMSON.

1st Vice President—JOHN MILHAN.

2d Vice President—OLIVER HULL.

3d Vice President—JAMES H. HART.

Treasurer.

CHARLES L. WHITE.

Secretary.

WILLIAM H. MILNOR.

Trustees.

BERNARD SOUILLARD,	GEORGE D. COGGESHALL,
JOHN CARLE, jr.,	MARCUS HURD,
DAVID T. LANMAN,	JAMES CRUMBIE,
MARSHALL C. SLOCUM,	BENJAMIN QUACKENBOSS,
JOHN MEAKIM.	

At the same meeting the following gentlemen were elected honorary members:

Robert Christison, Professor Medical Jurisprudence, in the University of Edinburgh.

Daniel B. Smith, President of the Philadelphia College of Pharmacy.

Henry Perrine, M. D., Indian Key, Florida.

Laurens Hull, M. D., Allegheny County, New York.

Betheul Pecks, M. D., Warren “ “ “

Seth H. Pratt, M. D., Alleghany “ “ “

Salmon Axtell, M. D., Washington “ “ “

Waterman Ellsworth, M.D., Chatauque “ “ “

Andrew Sill, M. D., Livingston “ “ “

<i>H. Mitchell</i> , M. D.,	Chenango county, New York,
<i>A. Leavenworth</i> , M. D.,	Cataraugus “ “ “
<i>A. McIntyre</i> , M. D.,	Warren “ “ “
<i>John Coats</i> , M. D.,	Genesee “ “ “

An Act to regulate the preparation and dispensing of medicines in the city of New York, passed March 11, 1839.

The people of the state of New York, represented in Senate and Assembly, do enact as follows:

SEC. 1.—No person shall be hereafter allowed to commence or practice, in the city of New York, the business of an apothecary, or that of preparing and dispensing medicine, or of preparing or putting up physicians' prescriptions, without having previously obtained the diploma of the College of Pharmacy of the city of New York, or unless furnished with a diploma from some other regularly constituted College of Pharmacy or Medicine, or shall have passed an examination of the censors of the medical society of one of the counties of this state, and have been furnished by such censors with a certificate of his qualifications for the business of an apothecary, which diploma or certificate he shall produce to the Secretary of the said College of Pharmacy to be by him registered without charge.

SEC. 2.—Any persons offending against the provisions of this law, shall be subject to a penalty of fifty-one dollars for each and every offence, which may be recovered with costs, in the name of the people of the state of New York, in any civil court of record, and the said fines when collected, after deducting such reasonable counsel fees as the court shall allow, shall be paid by the district attorney to the Treasurer of the New York City Dispensary for the use of said Dispensary.

SEC. 3.—This law shall not apply to persons who now are in said business, nor to the preparation and dispensing of medicines by licensed physicians.

MISCELLANY.

On the action of weak alkaline solutions upon some of the metals, by M. VOGEL DE MUNICH.—(Extract.) I may add some observations upon the manner in which the alkalies appear to affect the oxidation of copper.

Daily experience teaches us that diluted sulphuric acid has the property of hastening the oxidation of copper by means of the air. But here the acid plays an active part, for it combines with the oxide of copper, which is formed by means of the oxygen of the air.

We cannot arrange, in the same class, the simultaneous action of the alkalies and air upon copper, because the diluted solution of the alkalies employed, does not suffer any change, or combine with the oxide of copper formed.

The alkalies appear, then, to act in a passive manner; nevertheless, they tend to set in action, and promote the affinity which exists between the copper and the oxygen of the air.

For this reason, we may consider the phenomena as a catalytic effect, similar to that of spongy platinum upon hydrogen and oxygen, or to the action which gold has upon the deutoxide of hydrogen.

We have already, in chemistry, many examples of this kind, in which we may perceive an influence purely catalytic, or even a mixed catalytic influence; that is, catalysis accompanied by more or less of affinity.

CONCLUSIONS.

It results from the experiment related—

1. That iron and steel may be protected from rust, by weak alkaline solutions.
2. That bars of steel preserve their metallic lustre even when in contact with one another.
3. That the absence of air is not the cause why steel is preserved from oxidation.
4. That antimony and nikel do not lose their lustre in weak alkaline solutions.
5. That bismuth becomes of a brass-yellow, and afterwards of a purple color.
6. That zinc and cadmium becomes covered with yellowish-gray films.

7. That lead and tin are attacked; the lead becoming covered with its carbonate, and the tin with its deutoxide.

8. That copper is attacked still more promptly by weak alkaline solutions, than all other metals, and that the oxidation of copper is even accelerated by strong solutions.

9. That brass becomes black in alkaline solutions, while the alloys of copper and nickel preserve perfectly their metallic aspect.

10. That potassa and soda, dissolved in much water, appears to produce the oxidation of copper by a catalytic influence.

11. Finally, that copper is capable of being bronzed by alkaline solutions.—*Journ. de Pharmacie.*

Ipecacuanha deprived of its nauseous substance.—M. Gay has given the following method of depriving ipecacuanha of its nauseous odor and disagreeable taste, which are often so inconvenient as to prevent its prescription by practitioners.

Take of pure rectified sulphuric ether, 6 parts,
Finely powdered ipecacuanha, 1 part.

Mix the powder in the ether, allow it to macerate for several hours, and filter; wash the powder with a small quantity of pure ether, dry it, and when the powder has lost the ethereal smell, triturate, and preserve for use.

The dose of the powder, thus prepared, is the same as that of common ipecacuanha; in fact it has not lost any of its active principle.

Journ. de Chemie Med.

Syrup of Cod Liver.—In Switzerland and Germany, the oil of cod liver is recommended in gouty and rheumatic affections, obstinate constipation, incontinence of urine, scrofula, rachitis, &c. M. Caron Villard has directed the attention of practitioners to this oil, and M. Duclon, pharmacien, in order to render it of more ready administration, has converted it into a syrup, the formula of which he gives in the *Bulletin Général de Therapeutique*. The following is the formula:

Take of Oil of Cod Liver,	℥ viij.
Gum Arabic, powdered,	℥ v.
Water,	℥ xij.
Syrup,	℥ iv.
Sugar,	℥ xxiv.

Make of the syrup, gum, oil, and water, an emulsion, in which dissolve the sugar with gentle heat; filter, and flavor with two ounces of orange flower water.

The dose administered depends upon that of the oil. It is three or four table-spoonsful a day for adults, and the same number of tea-spoons-

ful for children. Hitherto it has been combined with carbonate of potassa and a little volatile oil.

The oil has also been given by injection, and employed by means of friction in larger doses. *Ibid.*

Salicine in Intermittent Fever.—Dr. A. Fioris has employed salicine in one hundred and eight cases of intermittent fever, with the greatest success. The highest dose administered was twenty-four grains, and in every case, except two, the disease was immediately moderated by the remedy, and eventually cured.

Med. Jahrbücher, Vol. 24, p. 174, and *Lancet*.

Preparation of Jalap.—The powder of jalap may be easily deprived of the nauseous taste, which renders it so disagreeable, by the following process:

R.—Powdered Jalap, one part.
 Rectified Sulphuric Ether, three parts.

Macerate for twenty-four hours, and then carefully decant the fluid which has acquired a deep yellow color. Add a fresh proportion of ether to the powder, macerate again for twenty-four hours, and decant. The powder must now be allowed to dry on a sheet of paper, and, when perfectly dry, is to be triturated in a mortar. By this means may be obtained a powder which is completely deprived of odor, and still retains all its purgative properties. *Lancet.*

Poisoning by a drachm and a half of Extract of Belladonna.—M. L., aged 20, brother of an apothecary of Perigeux, had been taking, for several days, whey mixed with the juice of herbs. On the 27th of last August, towards 10 o'clock, P. M., he drank a glass of fluid, which he thought to be his usual dose, and went to bed. After half an hour's drowsiness, with extreme agitation, he was aroused from experiencing general uneasiness and extreme debility; in a short time he became delirious, with universal and continued agitation, and noisy loquacity. He thought he saw around him flying butterflies and insects of every kind; he scratched his skin, and rubbed his nose, and covered and uncovered himself constantly; his tongue became red and exceedingly dry; pulse 120; face injected; eyes red; pupils so dilated that their opening was lost in the circumference of the cornea; the delirium became furious; it required six persons to restrain him.

M. Parrot administered in succession three grains of tartar emetic without effect, until the last, which produced some vomiting. He then had recourse to a large bleeding, in consultation with M. Galos; free puking was thus induced instantaneously, and there was voided a liquid having the color of a solution of belladonna. This was at 2 o'clock, P. M.;

the delirium, so far from diminishing, appeared to augment; the pulse became small and contracted; the respiration stertorous; and the condition of the patient became very alarming. Another bleeding was practised during the night; improvement; water acidulated with vinegar administered as a drink; potion with ether; purgative enema; better.

Next day, continuance of loquacity and disorder of intellect; agitation; rubs his nose; pupils still much dilated; tongue red; abdomen painful; pulse frequent and hard. Fifteen leeches to the epigastrium; a warm bath; same drink. From this time there was progressive amelioration, and finally a cure.

This observation is analogous to another reported in 1815, in the *Gazette Medicale*: in that case the belladonna had been taken by injection, and in larger dose. The resulting phenomena were nearly the same in both cases.

P.

Journ. de Chimie Med.

A new Pipette, by A. LEVOL.—I have used, for the purpose of washing filters, a pipette, which is very simple, and appears to have some advantages over those which are in common use, and which, for these reasons, I will describe. It is composed of a small and straight tube, drawn out at its upper extremity, the other being inserted in a flask which contains the water, as in the common manner; but I add a tube, curved in the form of a syphon, of which one of the branches is inserted into the flask to the bottom, and the other remains without. It is evident, then, that, on inverting the apparatus, the flow of the water will take place from atmospheric pressure, with greater or less rapidity, according to the height of the column of liquid; and this may be accelerated by blowing into the exterior branch of the syphon. This apparatus will also permit the use of hot water, as has been latterly recommended in the lessons at the School of Mines.—*Ann. de Chim. et de Phys.*

Bichromate of Perchloride of Chromium.—This remarkable compound was discovered by Berzelius; it was at first called perchloride of chromium, because when put into contact with water it was changed into chromic and hydrochloric acid. Its true composition was ascertained by M. Henrich Rose.

M. P. Walter gives the following process for preparing this compound: put into a tubulated glass retort an intimate and finely powdered mixture of 100 parts of fused common salt, and 168 parts of neutral chromate of potash; an S tube is to be put into the tubulure of the retort, through which there are gradually poured 300 parts of concentrated sulphuric acid. The action is rapid from the commencement; intense red vapors, accompanied by much chlorine, are disengaged. The receiver is to be kept cold to condense the vapor. The acid must be gradually added, or otherwise a

loss of the red vapor will take place, and besides this the contents of the retort rise and pass into the receiver. As soon as the acid is added, the retort is to be gently heated, and the heat is to be increased, until yellow vapors begin to arise; the operation is then finished. In the receiver there is found a liquid of an intense red color, and a solid substance, which, according to M. Dumas, is a compound of this substance with chlorine. By decantation they may be separated, and the liquor when rectified, so as not to obtain the whole of it, yields a compound, the boiling point of which is constant.

The liquid thus obtained is of a magnificent blood-red color; it is volatile, and yields fumes abundantly; when put into a quantity of water it falls to the bottom in drops of an oily appearance, and is converted into chromic and hydrochloric acids. Its boiling point is 244° Fahr., and its specific gravity is 1.71; it acts rapidly on mercury; it is decomposed by sulphur, detonates with phosphorus, dissolves chlorine and iodine, and combines with ammonia with the disengagement of light. A small quantity mixed with concentrated alcohol combines with it with violent explosion, and the inflamed alcohol is projected with force. This unexpected action had nearly deprived M. Walter of his eyesight, and burnt him horribly.

The analysis of this substance by M. Walter, agrees with that of M. Rose, namely,

Oxygen,	.	.	.	.	19.28
Chlorine,	.	.	.	.	45.14
Chromium,	.	.	.	.	35.58—100

Ann. de Chimie, et de Physique.

It appears to me that it would be more simple to consider this compound as an oxichloride of chromium, than a bichromate of perchloride of chromium. It might be regarded as composed of

Two equivs. of Oxygen,	.	.	16	or 20
One equiv. of Chlorine,	.	.	36	45
One equiv. of Chromium,	.	.	28	35
			—	—
			80	100

Lond. and Edin. Philos. Mag.

On the action of Fermentation on a mixture of Oxygen and Hydrogen Gases; by M. THEOD. DE SAUSSURE.—It is well known that the quantity of hydrogen gas contained in the atmosphere does not amount to 1-1000th of its volume. Nevertheless the decomposition of organic matters continually adds fresh quantities of this gas to atmospheric air; on the other hand there are few substances which occasion the combination of hydrogen with oxygen at common temperatures; and the circumstances which the combination requires, prove that the disappearance of the hydrogen cannot be accounted for in this way. M. de Saussure states that

he has found that the combination is effected by the fermentation of organic substances universally distributed over the surface of the soil, even when on account of the smallness of their quantity and the slowness of their operation no rise of temperature takes place.

By exposing fermentable bodies in pieces of the size of a nut to the mixed gases, M. de Saussure has arrived at the following conclusions:—The combination of hydrogen and oxygen gases may be effected without inflammation at the temperature of the air, by bodies submitted to slow fermentation.

They usually produce this combination when they are accumulated and impregnated with a sufficient quantity of water to prevent their complete contact with the oxygen gas. If this contact be made by increasing the surface of the fermentable body, or by diminishing the quantity of water, the hydrogen gas, is not absorbed, and the oxygen gas disappears in other combination.

The porosity of the fermenting body greatly contributes to the destruction of the detonating mixture.

Many observations prove that the hydrogen gas which disappears by fermentation combines with the oxygen gas, in the proportion of the elements of water. The demonstration requires that the oxygen shall be employed only to form this water, and all the carbonic acid produced in the operation.

The fermentable substances mentioned in the memoir do not effect the combination of the oxygen and hydrogen gases before they ferment, nor when the fermentation is stopped by an antiseptic. Soils and humus, mixed with different earths, undergo a slow fermentation as soon as they are moistened, which gives them the power of destroying the mixture of oxygen and hydrogen gases.

Gaseous oxide of carbon, and carburetted hydrogen gas, obtained by decomposing water with red-hot iron, were not destroyed by fermentation when they were substituted for common hydrogen gas, in the explosive mixture formed of two volumes of hydrogen gas and one volume of oxygen gas. Azotic, hydrogen and oxygen gases, added to the explosive mixture, do not present any remarkable obstacle to the destruction of an explosive mixture by a fermenting body, nor to that which is effected under the same circumstances by a plate of platina recently cleaned.

Oxide of carbon, and olefiant gas and others, which prevent the combination of oxygen and hydrogen by platina, are also great obstacles to the same result of fermentation.

Nitrous oxide, added to the explosive mixture, was partly decomposed by fermentation, and did not prevent the combination of the hydrogen and oxygen gases.—*Bibl. Univ. Feb. 1838. Sup. to Lond. & Edin. Philos. Mag.*

Balsam of Peru.—M. Fremy, in a paper upon the balsams, has proven that there may be obtained from the liquid balsam of Peru, by very simple means, two substances, one liquid and the other crystalline. The liquid matter, which he has called *Cinnamine*, exhibits great analogy to the fatty bodies. When it is treated with a concentrated solution of potassa, it is changed into cinnamate of potassa and a neutral volatile substance, which he has called *Peruvine*. This reaction takes place without disengagement of gas, or absorption of oxygen.

When cinnamine is treated by hydrate of potassa in fragments, the cinnamate of potassa is again formed; but, in this case, pure hydrogen is disengaged, and there is no trace of *Peruvine*. The composition of cinnamine explains perfectly these reactions. The crystalline matter of balsam of Peru is, in composition, a hydrate of cinnamine, and has similar reactions. When treated by hydrate of potassa, it is changed into cinnamate of potassa, and pure hydrogen is disengaged.

These two bodies form the resin and cinnamic acid which is met with in balsams exposed to the air. The balsam of Tolu has exactly the same composition as the balsam of Peru; it also contains cinnamic acid, and a resin of the same composition as that of balsam of Peru.

Acad. des Sciences, Journ. de Chim. Medicale.

Falsification of Manna.—M. Boenoist, pharmacien at Saumar, states, that he received, a short time since, from a druggist of Paris, a quantity of manna in sorts, mixed with a substance which he recognised to be *sugar of amidon*. Having, without difficulty, separated a pound of this substance from twelve of manna, he was convinced that a pound of it still remained, which was so divided, and agglutinated with the fat manna, that it would have required a considerable expenditure of time to extract the whole of it.

Upon examining, attentively, this manna, the substance was perceived existing under the form of small, irregular pieces, sometimes isolated, and at others agglutinated with the manna. These fragments, which, in addition, never assume the form of tears, are, in general, harder, and have neither the taste or the crystalline form of manna. Their fracture is granulated and gritty to the knife, their surface is shining. Among these pieces it is impossible to find a single one which has the form of a tear; thus none present a convex and a concave side, the result of the solidification of the manna upon the branches of the trees which produce it.

The same falsification has been submitted to the Societé de Pharmacie, by M. Soubeiran, August, 1837.

Journ. de Pharmacie.

Sophistication of Carmine.—M. C. C. Ehrenberg informs us, that he has found in commerce, under the form of troches, a very beautiful carmine, of high price, which, nevertheless, has undergone sophistication. When

employed for the ordinary purposes of painting, no difference can be detected between it and the purest carmine; by means of the microscope, it can be discovered that half of it is composed of wheat starch, which, intimately commingled with the minutely divided carmine, gives to it a brilliancy, and considerably increases the clearness of its color. When this article is diffused through a large quantity of water, it remains for a long time suspended, and finally produces a deposit, similar in appearance to white lead, but readily distinguished from it, simply by its specific weight, which is less. This sediment is nothing else than amidon, for it is rendered gelatinous by boiling water, and is colored blue by iodine.

It may be interesting to artists to know that some colors of this kind, mixed with organic substances, although generally pretty permanent, are, nevertheless, subject to decomposition in a humid atmosphere, and that amidon, in consequence of its transparency, covers a less surface than white lead.

Lon. Phil. Mag., and Journ. de Pharm.

Action of Nitroxanthic Acid upon the solution of Opium, by M. MULLER.—Nitroxanthic acid, formed, as is known, by the action of nitric acid upon indigo, exhibits a characteristic reaction with the solution of opium. It instantaneously occasions, in these solutions, even when diluted, a canary-yellow precipitate, while the liquid becomes colored wine-red. The precipitate collected upon a filter, has a reddish-yellow color, and an extremely unctuous consistence; it is soluble in alcohol and many of the essential oils, and partly in ether, the acids, and alkalies.

This substance appears to be a combination of *bitter* of Welter, (carbazotic or picric acid,) with the balsam of opium, and it may be named myroxanthe, (yellow balsam,) or picroxanthe, (yellow bitter.)

The nitroxanthic acid, in consequence of this reaction, may serve as a re-agent for opium, because it produces a precipitate with solutions of opium, even the most dilute, and because the unctuous substance develops the characteristic odor of opium when heated, even when the quantity is very small.

Journ. de Pharm.

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ORIGINAL COMMUNICATIONS.

ART. XIV.—ADDRESS DELIVERED TO THE GRADUATES OF
THE PHILADELPHIA COLLEGE OF PHARMACY, April 23d
1839. By JOSEPH CARSON, M. D. Prof. of Mat. Med. and Pharmacy.

GENTLEMEN:

To comply with an established custom, I present myself before you upon the present occasion, having been appointed the organ of the Institution, in which have been pursued the studies requisite to qualify you for the exercise of your profession. In addressing you, however, it would be impossible to divest myself of the feelings and sympathies which have arisen from the relation hitherto existing between us, a relation originating in the part I have taken in the direction of your studies. Still retaining, therefore, the recollection of the office as your teacher, through which I have been intimately associated with you, I conceive that I am acting in a two-fold capacity, and that while my claims upon your attention are strengthened, I am impelled, by an additional motive, to execute faithfully the last official duty in which you are interested.

From the evidence adduced upon examination before the constituted authority, your acquirements in the branches of science taught in the College of Pharmacy, and the proficiency you have attained in the pharmaceutic art, have been deemed sufficient to entitle you to the honors of graduation, the reward

merited by your assiduity and careful preparation to deserve them. My first impulse is, to congratulate you upon the happy fulfilment of the laudable aspirations by which you have been actuated, in pursuing your probationary course, and in so doing, I may assert, I have the heartfelt concurrence of my coadjutor and the members of the College. But it would be an abuse of the trust confided to me, did I indulge in extended complimentary remarks upon the attention given to preliminary qualifications; much worthier are the purposes designed by my appointment; and with the desire of fulfilling them, I shall take advantage of the opportunity, to impress upon you correct views of the profession you have chosen, to indicate the objects you should strive to attain, the means you should employ, and the motives by which you should be governed. These will be the topics of the discourse to be delivered.

The profession of Pharmacy is one of those having for their object the good of mankind; it is inseparably connected with the general welfare. To appreciate its importance, it is only needful to look back through the vista of time, and recognise its existence from the earliest date. The benefits derived from it have been admitted to be of the highest consequence, and public opinion has at every period been kindly affected towards it, as evinced by the estimation in which it has been and continues to be held. Nor from the duties it imposes, could the regard conferred be more richly deserved by any other employment; like the profession of medicine, of which it is the handmaid, it has been called into operation by necessity, and owes its origin to the frailties, the infirmities, the perishable condition of the human family. It affords resources against pain, disease, and death, and has a powerful influence over the passions and the affections of man, as it is capable of exciting his hopes, allaying his fears, and ministering to his comforts and wants.

Were we merely indebted to Pharmacy for the means of mitigating the ills of life, it would be sufficient to call forth expressions of merited commendation. But there is another point of view under which it is to be considered, which is, the

agency it has exercised in promoting the advancement of our race, by communicating a power over external circumstances, through efficient instruments, which have been successfully employed with this effect. In attributing to Pharmacy the credit of bestowing innumerable advantages which are now possessed, it must be regarded as a comprehensive science, embodying a number of subsidiary departments, each of which has a separate sphere of usefulness. However independent they may appear of a parent stock, it should be borne in mind, that they were originally the offspring of pharmaceutical investigation, and in their infancy were sustained by the fostering care and nourishment which this afforded. The objects that first excited attention, were the articles composing, or likely to contribute to the *materia medica*; the researches instituted were such as would lead to a more extensive acquaintance with their nature, peculiarities, mutual relations, and uses. The first naturalists and natural philosophers were pharmacutists, who entered upon an exploration of the material world, solely with the desire to add to their facilities of practice. With so extensive a field, it could not be otherwise than that an abundant harvest of discovery should reward the labor of observation and experiment, and that knowledge, general as well as particular in its application, should be elicited; to this is to be traced the birth of Chemistry, Botany, Zoology, Mineralogy, and Natural Philosophy, the branches of which Pharmacy is composed. It is not essential to enter into the details, by an exposition of which it could be shown, that these sciences have been of indispensable service in promoting the arts, whereby the lowest member of a civilized and refined community is incomparably superior to the savage—they are known to every one who is the least conversant with the subject: Agriculture, Manufactures, Commerce, and even Literature, have been more or less indebted to them. Surely, then, it is not an assumption to assert, that Pharmacy has performed a conspicuous part in working a favorable change upon the physical as well as moral condition of mankind, in revolutionizing the aspect of the social state. Hence it is entitled to a larger proportion of respect and gratitude.

But Pharmacy is yet more fortunate; for while it should be cherished, on account of its direct utility, it furnishes subjects for contemplation, that can attract, elevate, and improve the mind. Let me present the grounds of this opinion. The sciences enumerated are devoted to the scrutiny of Nature, implying an examination of her productions, and the determination of the forces every where operative in the origination of phenomena. How ample the range it offers! Take either Botany, Zoology, or Mineralogy, and its objects are not confined to place or country; there is no restriction to its inquiries, except that which the limits of the earth impose; for in every region the most valuable treasures have been detected. How diversified the structure, forms, and properties exhibited! Pass in review these several departments, and it will be manifest that each comprises a multitude of individual existences, dissimilar in construction, appearance, and inherent qualities. What order prevails among these beings! With what regularity are their parts conjoined, and with what subserviency of purpose are they fitted to one another! Examine an animal, a plant, or a crystal, and nothing can be detected at variance with an universal principle of harmony.

Extended as may be the sources whence bodies are derived, whether organic or inorganic, infinite as may be their forms, complex as may be their parts, and various as are their qualities, still investigation is not satisfied; Chemistry submits them to its operations, their composition is determined, and such as are compound are resolved into their simple elements; the laws that govern particles and masses, that regulate their movements, are expounded; the numerous processes through which matter must pass in the assumption of new shapes are developed, while the agents are indicated that serve to effect such modifications. From data thus supplied, the plan on which our globe is formed can be elucidated; Eternal wisdom and design can be made evident. Now, I would ask, if such be the nature of the pursuits embraced by Pharmacy, if such the tendencies of which they are susceptible, when carried to their full extent, where can there be found others

possessed of greater fascination? By which among the many classes of human learning, can higher tone of intellect be given?

Again, while thus expressing our views of the nature and tendencies of the pursuits connected with Pharmacy, let us observe the influence they are capable of exerting upon the mental faculties. The facts that constitute the knowledge necessary to be acquired, are not seen through the dim medium of conjecture, but have been revealed and made conspicuous from close, accurate, and reiterated inspection; they are based upon the strictest evidence. Neither are they promiscuously commingled: for they have been so arranged and systematized, as to render their perpetuity indubitable, and their attainment easy. For these reasons, this knowledge is entitled to the name of *positive*. It regards demonstration as indispensable to establish propositions, and admits no conclusions to be sound but such as have been arrived at by rigid induction. To avoid the causes of deceit, the perception must be aroused, the reasoning powers invigorated, and such mental training is enforced, as to be productive of lasting beneficial consequences. Nor are the advantages of discipline, imposed by pharmaceutic studies, when rightly conducted, confined to their own circle; the habitual preciseness of reflection they engender, extends to other subjects, and facilitates the formation of correct opinions upon all things; the judgment, prepared and fortified against the attack of specious fallacies, or false pretensions, remains unbiassed in its decisions, undazzled by the glare that plausibility may throw around assertions, having the semblance, but not the reality of truth; it has settled principles to rely upon, and protected by the firm and serviceable *Ægis* which they form, is unaffected by the shafts that subtle error may direct.

In the delineation given, I believe that an over estimate has not been made of the services rendered by an enlightened profession, and that too high a valuation has not been placed upon its acquirements—they are eminently liberal.

Having selected this profession, and assumed its most seri-

ous responsibilities, the obligation rests upon you to acquit yourselves of them with fidelity. For the purpose of becoming competent to the fulfilment of your duties, you have attended the preparatory courses of instruction; you have familiarized yourselves with the leading facts and principles of the tributary departments of science, but here is not the conclusion of your labors; what you have so far accomplished can only be considered as rudimental; the ground work only has been laid of the edifice to be built hereafter; the materials you at present possess are not sufficient for its completion; a larger amount must be collected, and they can only be procured by sedulously cultivating the same pursuits: the just proportions into which they will be moulded, the degree of finish that will be communicated, will be indicative of your ability and industry. Hitherto, as pupils of this school, you have submitted to its authority, you have acknowledged its jurisdiction; but emancipated from its control, henceforward you are answerable to the public, and must seek its approbation; its favor will be awarded or withheld as you may appear deserving or unworthy.

When commencing a profession, the resolution should be formed, not to fall short of excellence; and this is in accordance with the natural impulses of an ingenuous mind. True superiority, however, is dependant on other circumstances, besides a spotaneous origin; it must be created by the endeavors of the individual who aspires at its possession. It is impossible to attain to it without exertion; if reached at all, it must be by diligence, energy, and vigilance; qualities which, if properly cherished and rightly directed, will lead to the best results. The irregular exercise of talents, called into activity upon extraordinary occasions which may be favorable for their display, may be productive of ephemeral applause, but the success that may attend the evidence of their power cannot outlive the moment, if they be permitted to relapse into sluggishness and inactivity. It is absolutely requisite that they should be employed in a way that will always contribute to some good purpose, constantly be conducive to some benefi-

cial end, and which, at the same time, will maintain them in a condition of readiness to meet the most urgent demands that may be made upon them. It is by this alone that efficiency is bestowed, which renders the struggle for advancement not fortuitous as regards the issue, while its possessor, moreover, can readily sustain himself in the elevated station to which he has been raised. Conjoined with uprightness and rectitude of conduct, the rewards are sure and permanent, for competency and usefulness are evidences of its possession. The superiority alluded to is essential to the pharmacist; without it, he can neither exercise his vocation with credit to himself, or with advantage to those dependant on him; it is understood to mean a thorough comprehension of every particular relating to his art, a facility and readiness of application under all possible emergencies, and to this goal his untiring efforts must be directed.

By tracing the history of Pharmacy through by-gone ages, and contrasting the conditions presented at different eras, we shall learn to appreciate the progress it has made. Here a close analogy will be found between it and other kindred sciences. From an examination of this kind, it will be perceived, that the supply of substances to be submitted to its manipulations has been greatly augmented, while the exactitude of these manipulations has been increased; that improvements have steadily been added, that accessions of every description have uniformly poured in upon it, contributing to render it more complete. Ready ingenuity and fertile invention have been expended in its behalf, with the especial object of better adapting it to fulfil its offices; nor have they been exhausted; endeavors having a similar tendency, are as energetically in operation, at the present time, as at any former period, and the same success attends them; to prove that such is the case, we need but refer to the announcement of new discoveries with which the numerous periodicals are teeming, and which each year brings into application. The pharmacist, therefore, cannot be stationary in his knowledge; adequate as he may be to the transaction of his busi-

ness when he begins it; he must keep pace with it; he must advance as it advances, otherwise he will be outstripped by more enterprising competitors. To maintain his standing, unremitting attention is indispensable, in order that he shall not be behind the information of the day, that he shall be enabled to appropriate to his own uses the latest improvements that have been made. In a word, it is important that he should be a reader.

It may be supposed by some, that the indulgence of studious inclinations is incompatible with those business habits which must be acquired before success can be commanded; be this as it may with other occupations, the pharmacist is obliged to prosecute his studies ardently; so to combine them with his more active engagements, as to have ample leisure for both; so to make the one subservient to the other, that intelligence and intellectual culture shall be apparent, and promptness, order, and regularity in the management of his concerns shall not be wanting. He whose deficiencies are obvious cannot expect to prosper, to secure the confidence of his fellow-citizens, to arrive at respectability. It is absurd to urge the plea, that time is not afforded to devote to the cultivation of that science, on a full acquaintance with which the very affairs depend that he is solicitous should thrive: it is but the subterfuge of ignorance; it may satisfy himself, but will not serve as an apology with the community. Neglect of either study or business is equally fatal; to each must be given a proper share of attention to form an accomplished pharmacist. To deal in drugs, to vend them merely, may not require the aid of science; but to modify them, to combine them, so that they shall fulfil the purposes of the physician; to render them fitted for administration to the sick, requires all the assistance that science is capable of yielding; and so surely as total failure will ensue, if undertaken without suitable qualifications, a corresponding result will be experienced, if such qualifications are not preserved, by a constant perusal of the treatises and publications devoted to the extension of the theory and practice of Pharmacy.

Nor ought the pharmacist exclusively to confine his reading to the subjects of his profession; he should make to contribute to his improvement a variety of information, which, by extending his ideas, and increasing his powers of usefulness, will enable him to become a more valuable member of society, without endangering inattention to his main pursuit.

Beside the possession of adequate knowledge, and sufficient skill to perform the duties of his profession, the reasonable expectation is entertained, that every one should use his exertions to promote its farther progress, and this is binding, in proportion to ability and opportunity. Science and art generally are more benefited by the limited contributions of the many, when taken in the aggregate, than by the more numerous additions of a few. How much greater is the proportion of names appended to a small number of observations, than of those upon which enviable distinction has been conferred by the extent and brilliancy of discoveries; and has it not often occurred that a single fact, announced by an unpretending individual, has been the starting point of important researches, by which exalted reputation has been obtained? How frequently has it happened, that a principle or law, that has revolutionized the whole body of doctrines previously accredited, has arisen from scattered, isolated truths, when to each has been given its appropriate position in a category; and yet he who has made a valuable observation, announced an unknown fact, or elicited important truths, is as well a benefactor of his age, as he who from them can fabricate a system. Could LINNÆUS or JUSSIEU, have formed their incomparable methods of classification, without subsidiary assistance freely procured by them from humbler laborers in the cause of Botany? Could LAVOISIER, DALTON, or GAY LUSSAC, have framed their respective theories of combustion, of atoms, of volumes, had they not been aided by antecedent and cotemporary operatives? Unrivalled as were the achievements which these illustrious men were capable of accomplishing, it would not have been possible for them to

attain so high a degree of eminence, to render themselves so worthy of admiration, had not the materials upon which to exercise their surpassing talents been abundantly furnished by industrious collaborators. The spirit of emulation should animate the inferior as well as superior functionaries of the temple of science; each one ministering at her altar should be zealous in discharging the duties of his station, for rank and dignity are apportioned as they are merited. All who can observe may render their services available, by recording the result of their observations, and thus contribute to the establishment of a common repository, readily accessible to those gifted individuals, to whom exclusively appertains the power to generalize effectually.

By taking a retrospective view of his profession, and fully comprehending the obstacles which have been overcome, the difficulties over which it has triumphed, the pharmacist will understand the means by which it has gradually assumed a position among the most estimable of which civilization can boast. If it be found that a high order of talent has been occupied with its details, it will, at the same time, be apparent, that indefatigable perseverance has been most effectual in bestowing so elevated a stand. Numerous examples might be cited to show, that discoveries the most remarkable, recorded on the pages of its annals, have been effected by the protracted exertions, not of one, but of many investigators; one or two of the most striking will be sufficient for illustration. Thus, the elaborate researches of PELLETIER and CAVENTOU, which eventuated in the entire development of the constituent principles of Cinchona, were preceded by those of GOMEZ, of DUNCAN, and of others still more antecedent; and the merit of having led the way in the detection of the ingredients of opium, is due to DEROSNE, SERTUERNER, and SEGUIN, while by ROBQUET, PELLETIER, DUMAS, and COUERBE, have they been fully revealed, and made subservient to use. Such instances are not to be disregarded, as from them can be derived ample encouragement to make known novel phenomena, under whatever circumstances occurring, as sooner or later they will be correctly interpreted.

In a narrative of past events, those of the future appear prefigured. The same succession will take place. If therefore, the pharmacist be influenced by a desire to assume an active part in promoting the farther progress of his profession, he will allow no occasion to escape improvement; he will ever be upon the alert to seize the opportunities that may occur; nay, further, he will solicitously seek them; and the individuals to whom Pharmacy is most indebted, have manifested unflinching readiness in so doing. But I need not dwell longer upon such considerations; those which have been brought before you are too plain to be misunderstood; they cannot be otherwise than admitted. Let them, then, be treasured in your memory; accustom yourselves to apply them as a profitable lesson for your guidance.

In addition to personal inducements, and the debt due to science, there remains a purpose, to be accomplished by cultivating your profession, which is paramount to all others, and which should never be lost sight of; I allude to its elevation and maintainance at home, upon an equality with the highest standard of proficiency to be found elsewhere. In this resides a legitimate source of emulation, and with this end in view, even rivalry may be permitted, as universal benefit alone can flow from it. To such a cause may be attributed, in part, the extraordinary advances made by Pharmacy since the commencement of the present century; and we may judge, how active must have been the feeling, when between nations, foreign to each other, the echo of one reported discovery or improvement, was but the announcement of another. The pharmacutists of France, of Germany, of England, seem especially to have been ambitious of the award of precedence, and by entering the arena of this praiseworthy competition, have exalted the professional reputation of their respective countries, at the same time, that by their united labors, they have bestowed innumerable blessings upon the world at large; among their number could be cited individuals, affording the noblest models for imitation, on whom the warmest expressions of eulogy might de-

servedly be expended. Agreeable as would be the occupation, I cannot dwell long, or minutely, upon the picture exhibited by the flattering condition of Pharmacy in the more favored regions of Europe, and I must turn to notice briefly its state in our own land, whither it has been transplanted. In venturing on this topic, I am aware the ground on which I tread is difficult, and I shall only introduce it so far as will enable me to carry out the tenor of the reflections on which I have already entered.

Pharmacy, with us has experienced some vicissitudes of fortune, and undergone changes of a nature calculated to conduce to its amelioration; these have in part been attributable to the surrounding circumstances by which it has been influenced, and partly to the well devised measures adopted by those to whom its guardianship has been committed. A long time has not elapsed, since it has been erected into a separate and independent profession, prior to which occurrence, it formed a portion of the avocations of the physician; the period had arrived when a separation became expedient, determined by the growing demands of the community, and the ample patronage that could be conferred upon a distinct body of pharmacutists; such a step was well calculated to promote its interests. Among a people constituted like ourselves, of whom the predominant feature is stirring enterprise, prevalent among all classes and in every pursuit, it were not possible that Pharmacy should remain unaffected by the activity around; consequently, soon after the transfer alluded to was effected, its susceptibilities of better management and regulation were so evident to the enlightened gentlemen to whose hands it was intrusted, as to induce them to make an attempt to remedy its deficiencies; and the results evince the wisdom, zeal, and spirit by which they were actuated. Under their auspices, the basis of a reformation was established, the extent of which, though small at first, has gradually increased, and now holds out the prospect of universal prevalence. It enters not into my plan to specify the innova-

tions that have been made, the abuses that have been corrected, the imperfections that have been remedied, through their instrumentality; the contrast between the practices noticed at present in the shops of pharmacutists, and those formerly to be met with, affords the fullest testimony on these points. Nor do I intend to expatiate upon the success of their endeavors to augment the facilities of information; to secure superior advantages of education for succeeding aspirants; to diffuse, extensively, knowledge upon all subjects connected with the profession; with these you are familiar, as in their enjoyment you have participated; but I would, by here referring to them, derive the incentives by which to stimulate your ambition, and urge upon you not to withhold your aid in hastening this great work of reformation, in demonstrating that Americans are not behind the age in talent or acquirement; and further exhort you, not to relax in effort, until the last vestige of foundation for the assertion has been removed, "that with us, Pharmacy, which has so greatly contributed to augment chemical science, and to enrich medicine with a host of new remedies, is considered rather as a business than a scientific profession."

In conclusion, I shall advert to a subject involving the standing of the profession as deeply as any of the considerations that have been insisted on, and which pertains to the high honor and strict integrity which should be preserved in all its transactions, and of which its practitioners should be most jealous. It has been remarked by a presiding officer of this College, on an occasion like the present, that Pharmacy is possessed of "tender reputation," an expression of its character as felicitous as it is true; at once intimating the readiness with which it may be tarnished, by acts the least at variance with the established laws of propriety, and the ruinous consequences that must attend their perpetration. Organized as the world now is, every honorable occupation may be perverted and disgraced by the designing and unprincipled, but such, especially, is the case with Pharmacy, which, from inherent causes, is more exposed and open than any other to the

practices of imposition, which either entirely elude or are difficult of detection. Its processes are complicated and necessarily elaborate; many of the substances with which it manipulates, either naturally possess a resemblance in sensible properties, or may be made to assume a similarity by art, more wonderful than alchymy. The persons to whom are dispensed its products, are generally the ignorant and unwary, who easily yield themselves the victims of deception; and as there are no legislative enactments by which it may be checked in its career, fraud in its Protean forms stalks with impunity throughout the land, amenable to no tribunal, and scarcely at the bar of public opinion. In the scheme of instruction with which you have been presented, it has been invariably an object to point out, and comment upon the methods by which fraudulent practices are accomplished, and to provide you with tests whereby to discriminate between spurious and genuine articles of the *materia medica*; in your hands this knowledge may be made a blessing or a curse, it may constitute you benefactors of your fellow citizens, or the veriest scourges that infest society. But I fear not that your acquirements will be applied to any improper uses. I entertain the belief that you have too long breathed a healthful moral atmosphere, to exist amidst the noxious vapors of imposture. I little apprehend a prostitution of your talents to the unworthy purposes of surreptitious gain; but rather possess the confident assurance, that by your future conduct you will evince the utter detestation in which you hold every thing approaching a dereliction of the most rigid honesty, and that, should ever sophistication, the opprobrium of your profession, be brought within your notice, you will lend your willing aid in its exposure.

Having now performed the task assigned to me, I shall terminate my remarks by expressing the hope that what has been said will be productive of future advantage to you. The matters of which I have treated are of the highest consequence, possessing an especial bearing upon the success attending your efforts in life; they constitute, however, but a

small proportion of those which might have been profitably brought forward; the void must be filled by your own information, aided by good sense and experience. Doubtless, by these means, you will arrive at the most correct views of duty, and will undeviatingly adhere to them. Yet I feel it obligatory upon me to remind you, that the contest in which you are about to engage is arduous, that all the resources at your command will be called into requisition, and the position you will assume, will depend upon the efficiency with which they are wielded; if failure be the result, you must sink into obscurity; if fortunate, you will be ornaments to your profession, and confer honor upon your *Alma Mater*.

ART. XV.—ON DICTAMNUS ALBUS. By AUGUSTINE DUHAMEL.

Names.—White dittany; *Dictame* (*Fraxinelle*) *blanc*, Fr.; *Dictamo blanco*, Sp.; *Weisser Diptam*, *Spectwurz*, Ger.; *Dittano blanco*, It.

Sexual System.—Decandria. Monogynia.

Natural Order.—*Rutacæ*, DEC. *Diosmæ*, R. BR.

Generic Character.—Calyx deciduous, five-parted; petals five, unequal; stamens ten, inclined, and covered at top with glandular tubercles; capsule with five carpels internally connected, compressed, bisperm.

Specific Character.—This beautiful plant, the only species of its genus, has two varieties, *purpurea* and *alba*. Its stem is about two feet high, simple, terete, flexuous. Its leaves are alternate, winged, and impari-pinnate, resembling those of the common ash, *Fraxinus excelsior*; hence its name of *Fraxinella*. The folioles are oval, shining and denticulate. The flowers, white or rose-colored, disposed in a straight and terminal raceme. The calyx and peduncle are viscous, and of a deep red. The petals open irregularly, and

the stamens are covered with glandular tubercles. The root, which is perennial, is long, thick and branched.

Habitat.—The White Dittany grows principally in the Southern provinces of France, Germany, and Italy.

History.—The specific name of this plant is derived from the color of the root, which has a strong and goat-like smell; this, as well as its bitter and aromatic taste is lost by drying. The American Dittany, sometimes confounded with it, is the *Cunila mariana*. The Dittany of the ancients, was the *Origanum dictamnus*. The White Dittany is cultivated for the beauty of its flowers, which appear in June and July, and though rare in America, may be seen growing in some of our gardens.

The whole plant is highly odoriferous, approaching somewhat to that of citron, but less agreeable. Some of the earlier works speak of flashes of light darting from the flowers at night, a phenomenon discovered by the daughter of Linnæus, which was attributed to phosphorescence, but this is satisfactorily explained by the following statement of later authorities. It is asserted that the emanation of volatile oil, which escapes from it in Southern countries, when in full bloom, and especially in hot summer evenings, when the vapor is more condensed, is sufficiently concentrated to be sometimes inflamed by the approach of a lighted candle, so that for a moment the plant is enveloped in a luminous circle or halo of fire. The effect, however, is not always general, as Mr. Biot, wishing to satisfy himself as to this fact, could only succeed in igniting, successively, the oily sacs, which surround the superior parts of the plant, by direct contact of flame, from which sacs the odor is evolved.

Properties and uses.—The bark of the root is the only part employed in Pharmacy. It is presented in pieces about an inch long, more or less thin, rolled up or flat, brittle, of a yellowish white color, possessing a feeble aroma and somewhat acrid bitter taste. If recently dried it powders with difficulty, becoming pasty under the pestle. For this purpose it should be well dried, and powdered in a covered mortar, as the light

particles that escape from it are exceedingly irritating to the nostrils and throat.

In the hot countries of Europe there is distilled from the flowers a highly perfumed water, which is employed as a cosmetic.

In commerce, the *medutillium*, deprived of its bark, is often substituted for the bark, but the fraud is easily recognised.

White Dittany is stimulant, diaphoretic, and vermifuge. Its chief use has been in epilepsy and hysteria, nervous fevers, and inveterate leucorrhœa.

It may be given in substance, infusion or decoction. Dose, ʒj. to ʒj. of the powder twice a day. A tincture is made in the proportion of two ounces to a pint of alcohol. Dose, twenty to sixty drops.

ANALYSIS.

Finding this plant had not yet been subjected to chemical investigation, I engaged in its analysis, not with the expectation of discovering some new alkaloid or detecting some peculiar hidden principle, but as much for my own satisfaction, as a desire to determine the principal constituents of the plant, and thus connect its chemical with the botanical history. I regret not having had some of the fresh plant to operate upon; but this being unattainable, I had recourse to a small quantity of the dry bark, which was all that could be found in our drug-mart.

A. *Experiment No. 1.*—A portion of the dried bark was incinerated in a crucible; the unconsumed product weighed one-tenth of the whole, having resisted the intense heat of a furnace.

2. To a portion of this residue, boiling water was added, and the whole thrown into a filter. The transparent liquid changed turmeric to brown, and restored reddened litmus.

3. Nitric acid poured upon the ashes caused a brisk effervescence; water was added to dilute it, and then filtered. The clear solution was then subjected by portions to experiment.

Ferrocyanate of potassa betrayed vividly the presence of iron, and oxalate of ammonia that of lime, by a dense white cloud. Caustic potassa and the mineral acids had no effect upon it. Traces of a phosphate were made evident by lime water,

which formed a precipitate that assumed a gelatinous aspect.

The presence of potassa was demonstrated by tartaric acid, forming a bitartrate. Nitrate of silver, hydrochlorate of baryta, and acetate of lead, caused precipitates perfectly soluble in nitric acid.

B. *Experiment No. 1.*—A portion of this bark, in a bruised state, underwent ebullition in several successive portions of water; the decoction possessed but little color, was very mucilaginous, frothed considerably upon agitation, was somewhat opalescent, and filtered with difficulty. Exposure to the air changed the residuum to an ashy-gray color.

2. The filtered solution was then subjected to the following experiments: With iodine in solution, starch was strongly developed. Sub-acetate of lead threw down a copious precipitate of gum and mucilage. Ferrocyanate of potassa, tincture of galls and salts of iron had no effect. Litmus had no action. Oxalate of ammonia produced a slight cloud.

3. The decoction was evaporated to the consistence of thick molasses, which it resembled in color, smell, and adhesiveness.

A portion of this extract was boiled with caustic potassa in a silver vessel, but gave no indication of sulphur.

4. With another portion of this extract an aqueous solution was made, to which sub. acet. plumbi. was added to get rid of the mucilaginous matters, the excess of lead thrown down by sulphuretted hydrogen, this again driven off by ebullition, and ammonia added to the filtered liquid—but with no satisfactory results.

5. Some of this extract again submitted to heat, puffed largely, and, when dry, was pulverulent; further heat caused it to give out the smell of burnt sugar, and a spongy charcoal was left behind.

C. *Experiment No. 1.*—Treated some Dittany, finely bruised, with cold water by displacement, from which resulted a straw colored limpid liquid, possessing a fainter odor but much more acrid taste than that furnished by decoction, leaving an impression upon the fauces which remained some time

The peculiar nauseating odor was abundantly given out by exposure to heat, which, after several hours, caused a flocculent matter to be deposited, apparently vegetable albumen. Decomposition ensued after 36 hours.

D. *Experiment No. 1.*—Some of the bruised bark was placed in a retort with water enough to cover it, and heat applied; a colorless liquid was distilled over, having the peculiar nauseous odor of the substance in a high degree, but a less sensible taste. No appearance of essential oil.

E. *Experiment No. 1.*—A small portion of the bark in powder was digested in alcohol for several days, and then decanted. It was of a light straw color and limpid. Water rendered it slightly lactescent, indicating resin, though in small quantity.

2. This tincture was submitted to the action of heat, and by evaporation furnished a light brown extract imparting at first a sweetish but afterwards an acrid taste. It was found to be very soluble in alcohol, sparingly so in ether, and for the most part soluble in water.

F. *Experiment No. 1.*—A similar portion of the powder was digested in ether for several days, then decanted, and allowed to evaporate spontaneously. There remained upon the sides of the capsule a minute portion of colorless oil, which left a permanent greasy stain upon paper, but it was in too small a quantity to be isolated; washed from the capsule by alcohol, it was found to possess a very pungent taste. There remained in the capsule a small quantity of resin and extractive matter.

G. *Experiment No. 1.*—The residua of the alcoholic and ethereal tinctures were further digested in boiling water, alcohol, and weak muriatic acid, successively, to take up the principles soluble in these *menstrua*. The remaining insoluble ligneous matter was decomposed by concentrated sulphuric acid, which, diluted with water, left an insoluble carbonaceous powder. With pure nitric acid, it was converted into a species of gum.

Nothing remains for me but to recapitulate the principles

indicated by these experiments. The bark of the Dittany contains: VEGETABLE ALBUMEN, GUM, STARCH, SUGAR, RESIN, EXTRACTIVE MATTER, A COLORLESS FATTY OIL, WOODY FIBRE, SALTS OF POTASSA AND LIME, AND IRON.

ART. XVI.—ON THE MANUFACTURE OF SULPHURIC ACID.

FOR several years past some manufacturers of France and England have been using a different process for procuring sulphuric acid than that which has hitherto been practised.

As we have not as yet seen any published notice of this method, we have thought that such information as we have been able to obtain from those who have seen this process in operation, would not be unacceptable to our readers.

The principal materials used in this method are sulphur and nitric acid aided by sulphuric acid and steam. The process is conducted in a suite of chambers (five or more) lined with lead. The only apparatus of which we have seen any diagram consists of five chambers of such a size as to produce 2900 lbs. of concentrated acid per diem. Four of the chambers are of a small size, and the other very large, and arranged to suit the convenience of the manufacturer in the following order. First, two of the smallest chambers, next the large chamber, and finally the other two, which are somewhat larger than the first, the smaller chambers being elevated to the ceiling of the largest.

Outside and near to one of the smallest chambers is to be placed a burner or vessel for the combustion of the sulphur, sufficiently large to hold the daily charge requisite for the supply of the chambers. This burner communicates with a small chamber by means of a large pipe which enters near the ceiling; this chamber then communicates with the next small chamber by means of a large pipe which commences near the bottom of the first, and ascends and termi-

nates near the ceiling of the other; this latter then communicates with the large chamber in the same manner.

The communication between the large chamber and the third, and between the third and fourth chambers, is somewhat different; the pipe connecting the largest chamber with the next is smaller in size than the former pipes of communication, and commences in a similar manner near the floor; after its exit from the large chamber it descends and enters the top of a box; from this box a second pipe ascends and enters near the ceiling of one of the second size chambers. From this chamber a similar pipe passes out, forming a communication with the last chamber, the same in every respect as that just described.

The last chamber has the same kind of pipe and box, but instead of being connected with another chamber, it communicates with the external air by means of a long terminal pipe.

The boxes mentioned are intended for the condensation of such acid vapours as escape condensation in the preceding chambers. Besides these pipes of communication for the conveyance of the acid vapors, there are small tubes by which the acid on the floor of the smaller chambers may be conveyed to the larger; the second chamber is thus connected with the first and this latter with the large chamber, while the last is in the same way connected with the fourth and this again with the large chamber; all these communications being commanded by stop cocks. In the sides of each chamber there are holes so arranged near the floor as to allow the inspection of the depth of the liquid and the withdrawal of a portion for examination. There are also doors in the side, and in the top a hole for the examination of the interior of each chamber. In the second chamber are placed several earthenware vessels each one higher than the next in succession, in such a position that when overflowing, the contents of the first may fall into the second, of the second into the third, and so on, those of the last falling on the floor of the chamber. A glass tube bent in the form of a syphon passes through the side of the chamber and goes to the bottom of the first vessel; this tube is connected at the other end by a stop cock with a glass funnel. This

funnel is intended to contain the nitric acid necessary for nitrification. The last part of the apparatus to be mentioned, is the steam boiler: this is of a low pressure kind, a half to one atmosphere being all that is required; it sends off two leaden pipes, which pass, the one into the pipe of communication between the second and third chambers immediately before its termination in the large chamber, and the other in a similar place in the pipe of communication between the third and fourth chambers; the orifice to allow exit for the steam is small; sometimes there is an additional pipe to the large chamber.

To set this apparatus in operation, the burner is to be charged with the sulphur, the nitric acid put in the funnel, the floors of the chambers to be covered to the depth of two inches with dilute sulphuric acid, and the earthenware vessels charged with strong sulphuric acid. The acid in the chambers should be of different degrees of dilution; in the first and second chamber strong; in the large, weaker; and in the last, weakest.

The nitric acid is to be allowed to run slowly into the chamber, and the steam boiler is set in operation for about one hour or more, when the sulphur is to be ignited and the combustion regulated by means of the doors in the burner. The entrance of steam into the chambers is to be regulated according to the appearance at the end of the pipe of exit; when there is too much steam, a large quantity of white vapor passes out; when too little, a small quantity; and when in exact proportion, the fumes of nitrous acid are distinctly perceptible.

The apparatus is kept in operation day and night without cessation. As soon as one charge of sulphur is burnt out the residue is withdrawn, and a fresh charge added, during which time the nitrification and steam is still kept in operation.

The acid in the small chambers is allowed to run into the large one according to the strength of the acid in the former and the depth in the latter. When the acid has accumulated in sufficient quantity and of proper strength in the large chamber, it is withdrawn for concentration, which is performed in the usual manner.

By this process every 100 pounds of sulphur yields 290

pounds of concentrated acid, at the cost (in Paris) of $1\frac{1}{4}$ cents per pound. The above proportion is about the theoretical quantity to be given by 100 pounds of sulphur; the sulphur used containing five per cent. of impurity. The quantity of oxygen yielded by the nitric acid used, is about one-fifth of that required to oxidate the sulphurous acid; the remainder must of course be supplied by the atmospheric air, which obtains access into the chambers.

The theory of the formation of sulphuric acid by this method is somewhat obscure, and we can only attain to a perfect knowledge of it, by knowing what interchange of elements takes place within the chambers. But from the known fact that sulphuric acid cannot be made by these means, unless the water in the chamber is previously acidified by sulphuric acid, it is probable that this acid acts as a catalytic agent in producing the decomposition of the nitric acid, and that thence the same phenomena result as in the process for the manufacture of sulphuric acid by means of sulphur and nitrate of potassa.

R. B.

SELECTED ARTICLES.

ART. XVII.—ON THE APPLICATION OF PLATINUM UPON OTHER METALS. By M. MELLY.

EVERY ONE is aware of the great advantages in chemical operations, which vessels of platinum have over those of all other metals, without exception. The greatest obstacle to their more extensive use, is their high price. Vessels of platinum, especially when of large size, as alembics, retorts, evaporating dishes, &c., are necessarily thick for the purpose of resisting injury, and the quantity of matter is very considerable, so that their price is then very high. It would, therefore, be useful to discover some means of constructing some instruments possessing the advantages of those made entirely of platinum, and of which the price should be infinitely less.

To accomplish this purpose, M. Melly has attempted to use platinum with a thinness much greater than ordinary—but supporting it by another metal, to which it remains applied. All that is to be desired in this respect has not been obtained, but the experiments may induce some practical chemist to continue the researches, and improve upon them so as to obtain complete success.

Three different processes have been tried to apply the platinum upon other metals.

The first of these modes is by compression. Here it is endeavored to attach the platinum by the processes already in use in plating with silver and gold, that is to say, to unite platinum upon copper or on brass by means of very strong pressure, in the hope of causing an adhesion in a solid manner,

and express all the air lodged between the two plates. The pressure, to effect this, should be very great, and the preliminary experiments with a roller not producing the desired effect, attempts were made with a hydraulic press at a pressure of about thirty atmospheres. The first attempt was made about two years since, upon a plate of two inches; and since, the experiment has been repeated many times upon plates of three and four inches square, and on plates of five and six inches in length.

To prevent costly and useless attempts in those who desire to repeat these experiments, the following details are given:

A very pure piece of platinum in the form of a square and thin plate is to be taken, together with a plate of copper somewhat larger and much thicker. The pieces are to be thoroughly polished, more especially on the sides which are to be in contact; they are then to be placed the one on the other, and being pressed close together, they are to be enveloped in a thin band of copper wound around in a spiral, (this precaution is indispensable to prevent the oxidation of the copper on its interior surface.) This being complete, they are to be rapidly heated in a forge previously in operation, and when a red heat is attained, they are taken out, placed under the piston of the press, and rapidly compressed while yet red. On being released from the piston, the two pieces will be found united, the plating with platinum being completed in a very short time, but a few minutes sufficing for the experiment when every thing is prepared.

The experiments by compression give very good results; the adhesion between the two plates takes place over the whole surface; the two pieces are perfectly united together, and by passing them between rollers we can obtain very thin plates.

By this first process, we may obtain vessels of great thinness as to the platinum, while at the same time protection is afforded by another metal with which it is connected. The proportion of the metals in the experiments made, was as one to thirty, and the platinum on each square inch weighed only

350 milligrammes; consequently a capsule with 40 square inches of surface, containing about five ounces of water, and capable of being used for all chemical purposes, as far as the internal surface is concerned, would cost when finished but thirty francs at most, while if wholly of platinum, and thin as possible, it would cost two hundred at least.

The second process which was employed was the use of an *amalgam*. A similar process has for a long time been in use for gilding by means of a mixture of mercury and gold and is an operation which succeeds very easily. It was therefore natural to try whether an amalgam of platinum would afford the same success. After having tried without success by several modes to prepare this amalgam, the following was hit upon. Platinum sponge (made at a low temperature, so as to be obtained in as minute a state of division as possible,) was taken and lightly broken up between the fingers; it was then passed through a sieve of silk, and placed in a well cleaned iron mortar along with a certain quantity of mercury; the bottom of the mortar was then slightly heated, and the mixture rubbed up for half an hour without intermission, under a chimney with a good draught; the mixture was then complete. The proportion which gave the best results were 100 of mercury for five of platinum. This mixture is heavy, pasty, and easily moulded in the fingers; by means of chamois leather we may express part of the mercury.

Nevertheless, if we attempt with this amalgam, to cover different metals with platinum, it will be found that some obstinately refuse to receive this amalgam, as for example, iron and copper, while silver and brass are easily covered with a film of platinum. This operation is, however, very delicate; it succeeds tolerably well with the silver of any ancient coins, because the impression is shallow, and they can be heated with safety. But the platinum deposited in this way is dark, porous, hardens with difficulty, does not adhere well when the mercury has been driven off by a low heat, and if heated still more, it frequently penetrates the substance of the metal

itself, and forms an alloy with the interior without covering the surface.

Finally it was attempted to cover some of the metals with platinum in the moist way. It is known that a metallic bar plunged into a solution of another metal, precipitates this latter, if it is the most oxidisable metal, and if the new salt formed is soluble. But this metallic deposit takes place in an irregular manner, frequently in small plates, in powder, or in crystalline grains, and does not apply itself upon the metal in such a manner as to cover it completely. An endeavor was made to ascertain whether the metal of the solution could not be compelled to remain applied to the surface of the precipitating metal, and thus cover it completely.

When a bar of iron or copper is plunged into an ordinary acid solution of chloride of platinum, the platinum is precipitated, but, as a gray powder, and in small plates; it does not remain applied to the bar, but soon falls to the bottom of the vessel. It is probable that the disengagement of hydrogen which takes place at the same time as the precipitation, occurring between the two metals, detaches the latter as soon as it is deposited; moreover, the metal becoming covered with a coating of oxide, this is of itself sufficient by its interposition to prevent the adhesion of the metal.

By modifying in different manners the circumstances of this experiment, a method of applying the metal in uniform and smooth layers has been obtained. But it is necessary to observe many precautions, without which the attempt will be imperfect, or fail completely: 1, the solution of platinum must be neutral or alkaline; 2, it must be much diluted; 3, it should be hot, (about 60 c.); 4, the contact of the metal (well polished) with the solution should be of short duration; 5, finally, the piece covered with platinum should be immediately washed in pure water. Without these precautions the platinum is precipitated as a black powder, but little adherent, which is easily rubbed off, and cannot acquire any polish.

Of these three processes the last is certainly the most easy, the quickest, and the most economical; a solution of platinum,

such as was used in the experiments, would answer to cover a great number of vessels; besides, this process permits us to repair our instruments ourselves, whenever they are injured. But, we must confess that it is as yet too imperfect for chemical uses; the platinum is not sufficiently adherent, and does not well resist strong acids; it may, however, furnish some useful applications, and perhaps become perfected. The second process, the amalgam with heat, is likewise of little cost, but there is much to be desired with regard to it. The first process, on the contrary, is costly, more difficult to execute, but it perfectly answers the desired object, and certainly merits the preference; the evaporating vessels covered within with platinum by this mode, answer the same purpose as those made entirely of platinum. We might, perhaps, for some purposes, cover both surfaces, or unite two methods, covering the interior by compression and the exterior by precipitation or amalgamation.

Acad. Roy. des Scien. Jour. de Chim. Med.

ART. XVIII.—OBSERVATIONS ON THE ANATOMICAL AND PHYSIOLOGICAL NATURE OF THE ERGOT OF RYE AND SOME OTHER GRASSES. By EDWIN J. QUEKETT, Esq. F. L. S. &c. Lecturer on Botany at the London Hospital and Aldersgate School of Medicine.

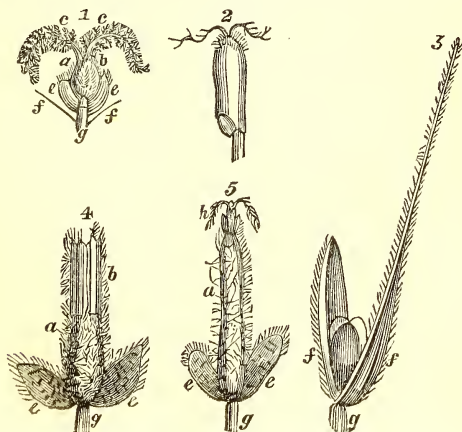
[*Abridged from a Paper read before the Linnean Society, November 4, 1838.*]

THE investigation of this peculiar formation has often occupied the attention of both English and foreign botanists, with the view of determining its nature and origin; yet notwithstanding the mystery belonging to it has not been completely removed, the observations of some of the latter authorities have gone far towards our viewing this substance in a clearer light, especially those of Dr. Phœbus, in the *Deutschlands*

kryptogamische Giftgewächse, and of Philippar, in his "*Traité Organographique et Physiologico-agricole sur l'Ergot, &c., dans les Cereales;*" from both of whom we learn much interesting matter, and also the history and former hypotheses of the ergot, which here will be omitted, for the sake of shortening this communication.

After many attempts at the examination of the ergot of rye in the state it is generally found in the shops, I could never succeed in finding any thing from such specimens, respecting its structure, that served to identify it satisfactorily with any other vegetable production; consequently it has long been my wish to obtain recent specimens of the rye, or any other ergotized grass, in order to trace the growth of the ergot from its first commencement, which I have this year been enabled to do; and one grass in particular, the *Elymus sabulosus*, a plant much larger than the rye, has afforded an excellent illustration of the growth and development of this anomalous formation.

In order to trace the ergot through its several phases, it is necessary to become acquainted with the normal size and characteristics of the grain of the several grasses, in its various stages, whilst healthy, and also the same conditions of its appendages, which may be probably understood from the figures and following description. When this examination is made



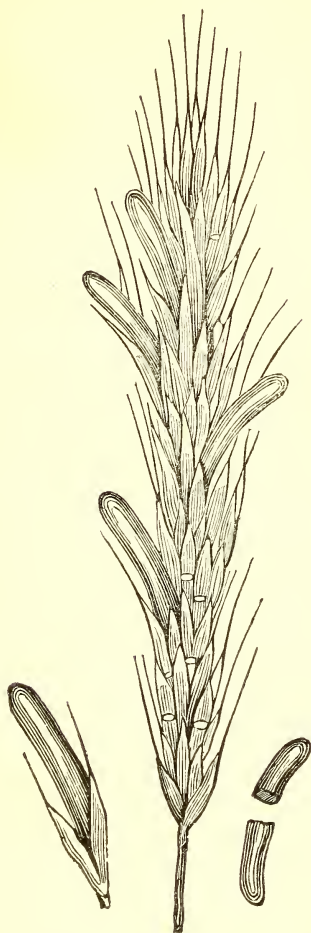
at an early period, it is found that the young grain of the rye is composed of a body or ovary minutely hairy, and of an oval form, (fig. 1, *a*), which is surmounted by a small crown of stiff hairs (*b*), from amidst which the two styles (*c c*) bearing plumose stigmas, take their origin from the apex of the grain; at this time the embryo is almost invisible; its place is seen at (*d*); below the grain can be observed the apex of the minute stalk or receptacle (*g*) on which it rests, and from which arise the two scales (*e e*) that cover the base of the ovary; the lines (*ff*) in fig. 1, show the position of the paleæ (*ff*, fig. 3). All of these organs, as well as their position and structure, it is necessary to bear in mind, in order to judge of their alteration in the diseased state.

When the grain of rye is matured, it frequently retains the remains of the stigmas and its hairy crown, as at fig. 2, *b* and *c c*, and always presents an enlarged embryo at its base (*a*), which is joined obliquely to the albumen (*d*) above, and is articulated inferiorly, together with the albumen, to the receptacle (*g*).

When the healthy condition of the young grain was clearly made out, it could easily be seen when that state would be departed from by any particular grain about to become replaced by an ergot; and it is seldom that more than two or three occur on the same spike, as represented in the figure, where the ergot is in its natural position.

The first appearance of the commencement of the growth of the ergot is observed by the young grain and its appendages becoming covered with multitudes of minute cobweb-like filaments, which run over all its parts, cementing anthers and stigmas together (fig. 4, *a*), and with a white coating, which appears as if plastered on or left by the evaporation of some liquid, and stuck to the surface of the body of the young ergot, completely concealing it from view, as represented fig. 4, *a*. This white covering could be most easily detached by placing the infected grain in a little water, when countless numbers of minute particles would be loosened from its surface, and

ultimately subside to the bottom of the vessel containing the fluid.



On many parts of the spike of the elymus, as well as on the rye, can be observed a viscid fluid, which, according to Philippar, oozes out of the ergot in the stage just described; and the greater the quantity the finer the ergot will be in that particular flower. This liquid is in abundance on the elymus,

and in the morning numbers of drops can be collected. I have rather given this an external origin, from the water of dew or rain becoming charged with the particles whilst lodging on the plant;* for my specimens when cut and placed in water, though they kept alive, exuded no viscid liquid whilst in doors; however, it may arise from the young ergot, as Philippar says, for I have not had many opportunities of watching the increase of this fluid on the growing plant. This fluid is slightly sweet, and contains myriads of the same particles as are deposited on the outside of the ergot. The axis of the ergot, when first appearing, is exceedingly soft; breaking easily across or in any other direction, and exhibiting, in its transverse section, a very irregular lobed or sinuous margin, of a purplish color, which is surrounded externally by the above-mentioned filaments and particles; this axis appears to be the body of the grain, which has now become changed by the presence and growth of the particles and filaments found upon it.

At this early period the size of the ergot is very small, measuring scarcely one-fifth of an inch; still its diminutive condition seems to be most favorable for the support and growth of the particles and filaments upon its surface (where they increase most rapidly;) for it is found that whilst the ergot is enlarging, there is not a corresponding increase in the number of filaments and particles, but rather a diminution of them, whilst it is advancing to maturity.

In the next stage (fig. 5) we observe the ergot is now grown to show itself just without the paleæ, and begins to show its purplish-black color, having by this time partially lost its white coating; in fact, when the ergot becomes visible by protruding between the paleæ, the production of filaments and particles has nearly ceased, and the ergot increases in a very rapid manner, according to Philippar only eight or ten days being required to complete its development, attaining in this

* It was found that when water is charged with a sufficient quantity of the particles adhering to the ergot, that it becomes viscid and sweetish, and evaporates very slowly; in fact, resembles the fluid that is observed on the exterior of the flowers of ergotized grasses.

short period a size four or five times larger than that attained by any healthy grain of the same plant in the same period.

The last stage of the ergot is, that it has elongated much beyond the paleæ that once inclosed it; and puts on a violet-black colour, from the diminution of the filaments and particles that infested it previously. Its length is found to vary in this state from half an inch to one inch and a half, in different specimens. Its form is seldom cylindrical, more frequently obscurely triangular, each side being marked with a furrow, one of them being generally deeper, and more conspicuous than the other two: besides these natural marks, there are a variety of cracks and fissures extending in many different directions. Either end of the ergot is inclined to be pointed, but the lower end more so, and presents a rather smooth extremity or cicatrix, by which it is articulated to the receptacle, between the two scales seen in figs. 4, 5, 6, (*e e.*) which are not destroyed by the unnatural growth that springs from between them, and it is extraordinary that Philippar makes no mention of these bodies at the base of the ergot. The summit of the ergot is surmounted (in those specimens which have been carefully gathered) by a small body, which is composed of the remains of the styles, the hairy crown, and a certain portion of the withered grain, as at figs. 5, 6, (*h h*); this body does not exist on the majority of specimens that are procured in the shops, because a very trifling force is sufficient to separate it from the apex of the ergot.

These observations are such as can be easily made with very little microscopic assistance, and have been probably witnessed by those who have previously paid attention to this subject, and who have given us various opinions respecting its nature; most of which tend to the describing the ergot as a particular fungus, to which we have the different names given by the following botanists, viz. *Sphacelia segetum* by Leveillé; *Sclerotium clavus* by De Candolle; *Clavaria clavus* by Münchenhausen; and lastly, *Spermoedia clavus* by Fries, who considers it more analagous to a diseased grain than to any species of fungus.

The contrary to these hitherto received opinions being about to be here advanced, from the results of many examinations of the ergot, in different conditions, and in different grasses, it is fair to explain the reasons for arriving at other conclusions, and those which lead me not to adopt the views of former investigators.

It has been shown that when the young grain of the grass is examined in the healthy state, that its summit bears a tuft of hairs, (particularly evident in *Elymus sabulosus*,) and the two stigmas which spring up amongst them, and at the base of the grain can be observed the two scales, and below the scales is the apex of the pedicle or receptacle, which serves to support the grain, the scales, and the paleæ, seen in fig. 1, and fig. 3. This structure is readily made out in the very young state of the grain, and can also be observed only more or less shrivelled by age, in every condition of the ergot up to its maturity, when the specimens are carefully selected for the purpose, all of which is accurately figured by Phœbus; then as these organs form the appendages at either end of the healthy grain, and they do the same in the ergot, there can be no doubt that the body between these organs in the healthy state is the grain; consequently the body that occupies the same position, but in an altered form, ought to be certainly no other than a grain, which differs from a healthy one, from having in its early state supported a parasite, which communicated to it some disease, which has perverted the normal state of its development. Notwithstanding the several parts of the grain are arranged as described, Philippar makes out the ergot, from his examinations, (which are the best of the later investigators,) to be a separate fungus; still his expressions* are rather vague respecting it, for, speaking of the ergot, he sometimes styles it "ergotized grain made up of fungic substance is the receptacle of the reproductive particles;" in another place, "that the ergot, as a fungus, springs from the receptacular point of the sexual

*Vid *Traité Organographique*, &c., pp. 121, 122, 123.

organs;" and lastly, he sums up by considering the "ergot as being the reproductive apparatus of a fungus." Philippar's reason for considering it a fungus arises principally from the microscopic examination of the structure of the ergot, which, as a fungus, he describes, beginning in the receptacle of the flower, and lifting up the sexual organs, which are diseased, but still remain upon the apex of the ergot, as in fig. 4; but it is found that where the paleæ are attached, and also the two scales, that this part which must be receptacle also, is not diseased, for these organs remain undisturbed; consequently it can only be the point where the grain and the receptacle unite that could give origin to any body taking the position of the ergot. Yet from this point, which is inseparable from the grain in the young state, it is most singular that in every kind of grass yet found ergotized, that the fungus should always burst through the tissue at this particular point, and at that particular time when the flower is about to expand. If it be a fungus solely, it ought certainly to burst forth as an ergot from the stem, or some other place on the several grasses, besides growing between and parting asunder two organs, which were as firmly united to each other in the young state, as the paleæ or glumes are to the same axis. Beside, the ergot, when matured like the ripe grain, slips out of the paleæ like a ripe filbert from its cupule, showing it has no organic connexion at this period with the receptacle more than the grain had. Philippar's examination of the internal part seemed especially to strengthen his view of its being a fungus; for he describes the body of the ergot to be composed internally of branched short fibres, and globules of various sizes, round and oval, which he considered the means of its reproduction. My own observations on the structure of the ergot differ somewhat from this, by believing that the fibres described are the boundaries of irregular cells, distorted by the fungoid matter, and not fibres at all; and the globules are not reproductive bodies, but those of a fatty oil which is contained in the interior of the cells, as seen fig. 7, in a transverse section magnified 1000 times. To witness these facts, take an ergot, scrape away with a knife all

its black coat, so as to remove all the particles that adhere to its surface, then to make some very thin transverse slices, and put them on a slip of glass under the microscope: and when water is added to them, it speedily becomes turbid or milky, from the quantity of particles that have escaped from the sections; these particles, however, are not heavier than the water, as those on the exterior of the ergot are, but are lighter, and collect on the surface, from whence they can be removed like cream from the surface of milk. When magnified, these particles are found to be of vastly many sizes, some as large as 1-1000th of an inch in diameter, others so small as to be barely visible when viewed to the extent that optical powers can assist us, and appear, when magnified, 1-1000th linear, very like the globules in human milk. When the water in which the slices have been placed is heated, these minute globules liquefy and run together, forming either very large globules or numerous irregular masses; their primary form, by this operation, being completely disturbed, which would not have been the case had they been "seminules," or reproductive agents, as Philippar imagined. To observe the structure of the ergot, make some thin slices, then boil them in ether, which dissolves the fatty matter, and makes their structure become visible, which is to all appearances irregularly cellular, and not fibrous.

Another argument against the ergot being a complete fungus is, that the particles which are its reproductive agents are most numerous when it is young, and it continues its growth after their production has ceased, which is contrary to the usual law amongst this class of vegetable productions; for their efforts to live are only to develop the means for propagation, dying, as it were, the instant this action has been accomplished.

Besides these, Vauquelin's chemical analysis proves its dissimilarity in composition with the FUNGACEÆ, and even with *Sclerotium*—a genus of that order to which the ergot was assigned by Fée and De Candolle—by containing very different constituents, which are the following :—

Coloring matter, soluble in alcohol.

White oil, very abundant, sweet.

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Violet matter, soluble in water.

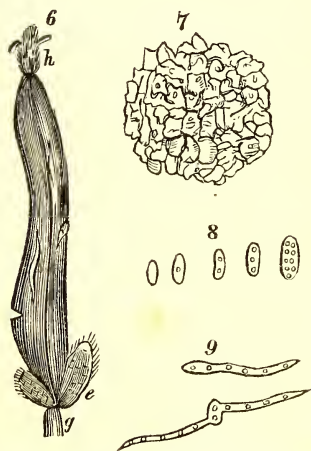
Fixed phosphoric acid.

Azotized matter, very abundant and alterable.

Free ammonia, at 100° Reaumur.

Thus far the argument against the ergot being a species of fungus are taken from the body itself; but by experiments and minute examinations of the particles which separate from its surface, or are found in the viscid fluid which lodges externally, additional proofs can be obtained that corroborate the former views of its nature.

When these particles are placed under a microscope, and magnified about 1000 times (linear) their minute structure becomes then discernible, and their shape is seen to be oval or elliptical, and occasionally a little contracted about midway, and contain several green granules, whose number varies in different particles; most frequently there are one, two, or three well defined spots in their interior, and occasionally there are as many as ten or twelve; and there can be no doubt that these minute bodies are the reproductive agents of a particular fungus, to which particles the term *sporidia* is applied, to characterize them, because their structure is unlike seeds, notwithstanding their office is the same. Various conditions of these are seen at fig. 8.



FIGS. 6, 7, 8 and 9.

The size of these sporidia, upon an average, is about the 1-4000th of an inch in length, and 1-6000th of an inch in diameter, and the number on each ergot is uncertain; but as so many have been rubbed from one specimen as would fill a square inch of surface, it is probable, from the above measurement of their size, that about twenty millions may be calculated as an average number on a full-sized specimen; and as an example of the extreme minuteness of organic matter, some of these sporidia contain eight or ten granules, which are so small that it would require 200 millions of such to cover the same surface, their size being not more than 1-50,000th part of an inch.

If these sporidia be kept moistened with water on any suitable surface, or on a piece of glass, which is covered with a thin piece of talc, after a time it will be observed that these minute bodies commence germinating in various ways, and with me have continued to grow in this manner nearly three months.

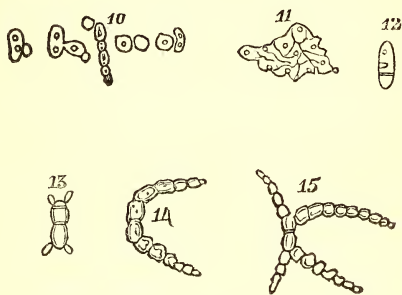
The most common method is that of the sporidia emitting a tube or tubes from some uncertain point or points, (fig. 9,) but generally opposite the spot where a green granule is lodged in the interior. This tube increases to an indefinite length, and contains throughout its interior similar green granules, arranged at short but generally equal distances, about as far from each other as they are in the interior of the sporidia; and I believe that this tube ultimately separates into fragments, constituting as many new ones.

In many other instances, the sporidia, instead of producing a tube, give origin, opposite a green granule, to a minute bud; this little point increases, and ultimately separates from the parent as a perfect sporidium, and frequently before its separation shows an indication of producing a similar one from itself, (fig. 10.)

Another way of increase amongst these singular germs is, that of the membrane composing the parietes of the sporidium breaking down, forming a flat patch, (fig. 11) which keeps extending in all directions, and developing upon itself green granules, such as are seen in the interior of the other sporidia.

These granules seem important points, and appear to be analogous to the embryo of the seeds of more highly organized plants.

The last and most remarkable manner of germination is that of the sporidia, having a septum formed across their interior, by a green granule extending itself laterally, which divides them into two parts, each of which becomes again divided by a similar process, seen at figs. 12, 13, 14, 15. By a repetition



of this method there at last is formed a moniliform filament, which, though simple in its origin, ultimately becomes branched, the branchlets most commonly radiating from a central collection of cellules. These filaments are the analogues of minute stems, and at a certain age give off, from innumerable points of their surface, little germs, which in a short time increase and become perfect sporidia, as seen figs. 16, 17 (*a a a*) which commence again in the several methods of germination just detailed. As the minute filaments belonging to one plant get what may be termed, ripe, the mass of cellules that have been developed about those first generated in the centre become to be considerably condensed and pressed together, as at fig. 17, (*b*), so as to lose the distinct boundaries they originally possessed; and they begin to assume a brownish-yellow color, and in fact, look now exactly like a section of the body of the ergot itself.

Here then has been witnessed by daily examinations, the growth of these sporidia, which, being found on the ergot of every grass, are without doubt connected with the cause of its

origin; these examinations show their various methods of germination, and their advancement to maturity and ultimate ripening, or producing the means of their reproduction; yet this minute plant does not measure more than 1-300th to 1-100th part of an inch in length or breadth.

The fact of having caused these minute plants to grow, independent or not connected with the body of the ergot, and without assuming any form in the least way similar to it, is the most convincing proof that the flocci, or arachnoid filaments, and the particles, before mentioned, occurring on the surface of the ergot, are no part of that body, but are the microscopic plants just described, which choose the grains of many grasses as the matrix of their developments, such plants belonging to the order of vegetables denominated Fungaceæ.

There are other proofs of the independent existence of the microscopic fungus, for it is found that it is not exclusively confined to the grain as a locality, but is observed to flourish on many other parts of the same grass, viz. in the interior and on the exterior of the anthers, on the paleæ, on the glumes, and on several parts of the rachis of the infected plant; but not occasioning there any exuberant growth of the part, for obvious reasons; because these parts have completed their development before the fungus makes its appearance; and their structure is not like that of the grain, which, at the period of the attack is exceedingly young, and just commencing to grow rapidly, and susceptible of impressions which can easily pervert its form and structure.

I conceive from the foregoing remarks that my examinations have proved that the ergot of the rye, as well as other grasses, is produced by a particular species of fungus, which develops itself upon or in the grain, whilst the latter is very young, causing its remarkable alteration from a healthy grain, in form, color, chemical composition, and properties.

The method by which this singular production probably originates (for at present all respecting this part is uncertain) is, that the sporidia of this fungus are by some means introduced into the interior of the plant, and ultimately arrive at

the grain, which they find the most suitable matrix for their development, or they are brought into contact with the young grain by some means (probably by the fluid) from without. In either case, when they come into contact with the grain, they lose no time in the work of reproduction, emitting their filaments through the tissue of the grain, and covering its body with multitudes of arachnoid filaments bearing sporidia, and apparently destroying its coats, as the matured ergot possesses no envelope.

Their presence communicates disease most frequently to the entire grain; sometimes, however, I have thought that the embryo only has been diseased, a part of the albumen remaining, along with the hairy tuft, on the apex of the ergot. This diseased action does not, I imagine, entirely deprive the grain of the power of growth, for it lives after the effects of the parasite have ceased: but it vitiates all its constituents, for neither starch nor gluten now exist, but instead, abundance of oil, which I suspect is produced by the grain, as none is seen from the microscopic plants whilst germinating in the way already described. As the ergot increases in size, it is made up partly of the diseased structure of the grain, and the fungic matter which has grown within it, which is like that observed when the parasitic plant grows unconnected with the grass, not being sporidia, but condensed cells such as compose the filaments, as at *b*, fig. 17.

To state my opinion, derived from experiments and examinations, which have been made and repeated again and again, in order to obviate every source of error arising from the manner in which they have been conducted, I would say, then, that I consider the body known as ergot to be a mass composed of the constituents of the diseased grain, mixed with fungic matter, occupying the place of the healthy ovary, of which can be observed some retained relics in its triangular shape, and the furrow on one of its sides, both conditions being those of the perfect grain also.

Since it has been, I trust, demonstrated that the ergot is no longer to be considered an independent fungus, it has become

necessary to alter its previous botanical relations, by dismissing the former appellations, and giving a new one to the minute plant, which is the cause of this singular production.

From comparisons with the characters of the present little plant, and with those of British and foreign genera of FUNGACEÆ, it has been found so unlike any of them, as to deserve being made a new genus, to which I have given the title of *Ergotætia*;^{*} and, after repeated examinations in the rye and other grasses, I have not hitherto found any material difference in the organization or characters of this parasite to warrant the making of those belonging to different grasses into different species, therefore I apply the specific term *abortans*† to the fungus found on the rye, and believe those on other grasses to be the same species.

This minute plant, from its structure and habit, will be classed in the suborder of FUNGACEÆ, *Coniomycetes* of Fries, and in the tribe of *Mucedines*.‡

Though many of these observations were primarily made with the elymus, because I had the plants in the growing state, yet the same experiments with the sporidia of the rye have been repeated, and with the same results, and the anatomy of the body of the ergot in both and in other grasses, seems to correspond in every respect.

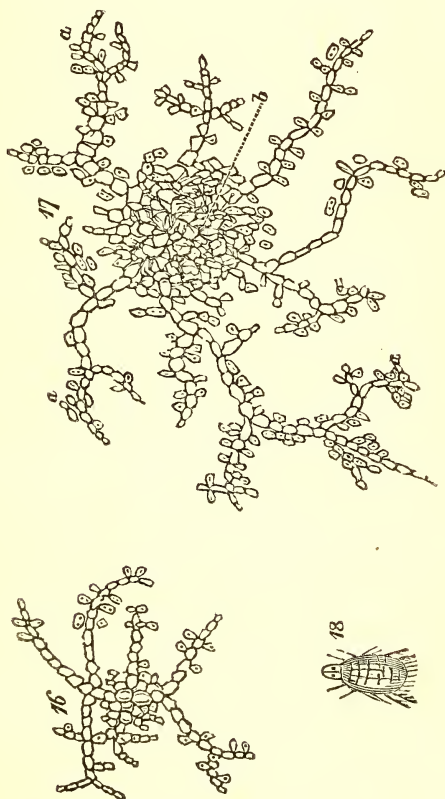
This is a point which, as regards the goodness of the ergot of rye, is deserving mention in this place, from having found, in numerous instances, that the specimens have frequently been not much more than hollow cases, instead of being solid. On looking for the cause it was found that these effects were

* From *Εγώρρη*, *Ergota*; and *αῖτια*, *origo*.

† The term applies directly to the fungus destroying the germinating power of the grain, and indirectly to the medicinal properties of the ergot.

‡ In Berkley's arrangement of the British Fungi, *Ergotætia* will be placed in the suborder *Hyphomycetes*, and in the tribe *Sepidoniei*, which is composed of plants having filaments not sporidiferous; the sporidia being heaped together, and lying upon the matrix, which is nearly the case with the parasite of the ergot, whose filaments do not often bear sporidia, or if so, not one-hundredth time so frequent as the sporidia develop one from another, forming a mass which completely invests the body of the ergot.

produced by numbers of small acari, (fig. 18) which devour the interior, thereby rendering such specimens nearly inert, and producing much powdery excrementitious matter about the ergot, similar to that observed with those species that dwell in cheese, or devour malted or other corn; therefore, the practice of keeping camphor, or some strongly smelling body with the ergot, is likely to be a preventive to the attacks of these tiny depredators.



EXPLANATION OF THE FIGURES.

FIG. 1 represents the young grain of rye twice its natural size, (*a*) being the ovary crowned with hairs (*b*); (*c c*) the feathery stigmas; (*d*) the place of the embryo; (*ee*) the two scales at the

base of grain; (*ff*) lines representing the position of the paleæ, which are seen in their natural condition in fig. 3; (*g*) the pedicel or receptacle to which the grain is attached.

FIG. 2 shows the ripe grain of rye, twice magnified; (*a*) embryo; (*b*) crown of hairs; (*cc*) shrivelled stigmas; (*d*) albumen, composing body of the grain; (*g*) pedicel.

FIG. 3 shows ripe grain in its natural position between the paleæ (*ff*).

FIG. 4 is intended to give a representation of the commencement of the formation of the ergot; but an accurate idea cannot be well given, on account of the minuteness of the particles and filaments composing the fungus: (*a*) is the ovary of the grain overrun with the fungus, which completely hides it from the view; (*b*) shows the fungus has cemented the anthers and the stigmas together; (*ee*) the two scales at its base, separated from each other to show the extent of the fungus, which stops generally at the receptacle (*g*), all these parts being twice or three times larger than natural.

FIG. 5. The ergot about half grown as it begins to show itself between the paleæ; (*a*) ergot beginning to lose most of its filaments and sporidia, and beginning to appear purplish; (*ee*) scales at its base, that have been spread open; (*g*) receptacle; (*h*) remains of hairy crown and stigmas.

FIG. 6. Matured ergot, exhibiting the furrow and several cracks and fissures, and retaining (*ee*) the two scales, and (*g*) receptacle, not altered; (*h*) remains of stigmas and hairy crown, still adhering. This and the preceding figure are twice the natural size also.

FIG. 7. A portion of a transverse section, so thin as to be transparent, magnified 700 times, showing the irregular, cellular structure enclosing minute fatty particles.

FIG. 8 represents some of the sporidia, magnified 1000 times, and which contain different numbers of green granules; the first, however, having none. Phœbus' figure of these is precisely similar; but Philippar's very imperfect.

FIG. 9 is their germination, by emitting tubes containing granules similar to those of the sporidium producing them.

FIG. 10 is their germination by giving off minute buds which ultimately become sporidia, four or five adhering occasionally to each other, and lastly separating.

FIG. 11 represents the membrane of the sporidium laid open and increasing in size, developing green granules on various parts of its surface.

FIG. 12 shows the manner a sporidium is divided by a septum or septa, by the green granules extending themselves laterally; different states being observed in the present figure.

FIGS. 13, 14, 15. Different stages of the same process.

FIG. 16. The fungus assuming a radiating form, and beginning to develop sporidia upon its branches.

FIG. 17. The fungus arrived at maturity, its centre showing a structure analagous to that seen in fig. 7, and its several branches loaded with sporidia. Figs. from 8 to 17 magnified 1000 times.

FIG. 18. The acarus which lives on the interior of the ergot, being about one-fourth the size of the cheese-mite; magnified 80 times.

ART. XIX.—RESEARCHES UPON SALICIN AND THE PRODUCTS DERIVED THEREFROM. BY M. R. PIRIA.

FEW chemical substances have received so little attention as salacin. Since its discovery by M. Leroux, MM. Pelouze and Jules Gay-Lussac have made known the results of the elementary analysis of this matter, and nearly at the same time Braconot verified some of its properties. I am not acquainted with any later researches.

The difficulty with which salacin enters into combination with other bodies, has been probably the cause of the neglect in which this body has remained until the commencement of these researches. In fact, bodies whose atomic weight may be de-

terminated by means of very definite combinations, would be much more like to promise important results from their study.

I had the good fortune, at the very commencement, to combine salacin with the oxide of lead. The analysis of this combination enabled me to establish the formula of salacin, both in a free state or when combined. This first step encouraged me to pursue my researches upon this, as I then supposed, sterile subject, but which I soon found to be very fruitful in new and interesting results. I do not flatter myself that these labors have completed the study of salacin; on the contrary, the subject is far from being exhausted. The long and expensive process which I employed to procure the hyduret of salicycle, the substance by means of which the interesting compounds, the objects of these researches, were obtained, prevented me from obtaining a large quantity of the products, and thus I was unable to make the study of each as complete as I would have desired. I nevertheless hope at some future time to fill up the deficiencies of the present paper.

I cannot, without being deficient in gratitude, pass without acknowledgment, the kindness of M. Dumas, in allowing me the use of his laboratory, and aiding me with his advice during these researches.

Salacin in a free state.

This matter is white, crystallized in plates, soluble in water and alcohol, insoluble in ether, fusible below 100° ; it does not contain nitrogen, and does not loose water when exposed to a temperature of 200° —sulphuric acid communicates to it a beautiful and intense red color. The action which weak acids, oxidating bodies, chlorine, &c. exercise upon it, will be detailed in the course of this paper.

The elementary composition of salacin was determined by MM. Pelouze and J. Gay-Lussac. According to these chemists, it is composed of

Carbon,	55.49
Hydrogen,	6.38
Oxygen,	38.13
	<hr/>
	100.00

The analyses which I have made accord as well as can be expected with those results. They result as follows:

	I.	II.	III.
Carbon,	55.68	55.04	55.54
Hydrogen,	6.36	6.39	6.43
Oxygen,	37.96	38.57	38.03
	<hr/>	<hr/>	<hr/>
	100.00	100.00	100.00

This point established, I pass immediately to the products derived from the action of different bodies upon salacin, and in the first rank I place those substances which are always formed whenever salacin is submitted to the influence of an oxidating body, under particular conditions. Their history is totally independent of that of salacin.

At the end of this paper I shall not fail to state some experiments, by the aid of which I believe that the formula and equivalent weight of salacin may be established.

The action of oxidating bodies.

The action which some oxidating bodies exercise upon salacin is, without doubt, the most remarkable which chemistry offers. The examination of the products of this reaction has led to very unexpected results.

We know from the experiments of Dœbereiner upon the production of formic acids, that salacin, as well as many other organic bodies, yields formic acid. When treated with peroxide of manganese and diluted sulphuric acid, I have also obtained the same result, but on using a mixture of bichromate of potassa and sulphuric acid as the oxidating agent, besides obtaining carbonic and formic acid, as in the preceding case, another very remarkable substance was produced, possessing very great

resemblance to the volatile oils. I shall call this body the hyduret of salicyle, to express the intimate analogy which exists between it and the oil of bitter almonds, which, according to the excellent researches of M. Liebig and Woehler, most chemists agree to regard as a hyduret of a compound radical. We shall see that the hyduret of salicyle comports itself exactly in the same manner with a great number of bodies, and I have from this been led to consider its composition as analagous.

Salicyle.

It is by this name that I designate a body hitherto unknown in a free state, and which plays the part of a simple substance in its combination with different bodies. Like benzule, it forms very definite combinations with hydrogen, oxygen, chlorine, bromine, and likewise with the metals.

The formula for salicyle is, $C^{28}H^{10}O^4$, and its combinations are represented by one equivalent of salicyle united to one equivalent of another body.

Benzule being composed of $C^{28}H^{10}O^2$, it will be seen that these two substances do not differ, except in containing different proportions of oxygen. Salicyle might be considered as a deutoxide of benzule, or rather these two radicals, as different degrees of oxidation of a carburetted hydrogen, having the formula, $C^{28}H^{10}$.

In fact, M. Dumas, some years since, put forth an hypothesis, according to which benzule and benzoic acid were to be regarded as oxides of an hypothetical carburet of hydrogen, which he called benzogen. Salicyle and salicylic acid would be two other oxides of benzogen. Benzogen, on this hypothesis, consequently forms four different combinations with oxygen; and in this respect, it agrees with the less known simple bodies. The following would be the series of these oxidations:

$C^{28}H^{10} + O^2$, benzule.

$C^{28}H^{10} + O^3$, anhydrous benzoic acids.

$C^{28}H^{10} + O^4$, salicyle.

$C^{28}H^{10} + O^5$, anhydrous salicylic acid.

Hyduret of Salicyle.

The hyduret of salicyle, in its crude state, presents itself under the form of an oil, of a more or less intense red color; its agreeable and aromatic odor resembles a little that of the oil of bitter almonds; a simple distillation suffices to deprive it of color. The distilled oil is perfectly colorless; but if left in contact with the air, or even in bottles badly stopped, it again becomes red. In other respects, besides the color, its properties are not changed by the air; its taste is burning and aromatic, like the volatile oils.

Water dissolves a notable quantity, and the aqueous solution possesses the odor and taste of the oil itself. It has no action on litmus paper; put in contact with the salts of the peroxide of iron, it produces a very intense violet color. This color, when not in contact with the air, undergoes no change, but by the action of the air or of an acid, it becomes a dirty yellow. The salts of the peroxide of iron and of every other metal have no action on the aqueous solution of hyduret of salicyle.

Alcohol and ether dissolves the hyduret of salicyle in every proportion. Its density is 1.1731 at the temperature of 13°.5; it boils at 196°.5 c. under the pressure of 0 .760.

The hyduret of salicyle decomposes the alkaline carbonates even in the cold. By the aid of a bottle the decomposition is very manifest; the hyduret is soon dissolved, and the carbonic acid given off.

The caustic alkalies, when put in contact with the hyduret, enter into combination with it. The combination takes place with the disengagement of heat, and the compound which results separates from the alkaline liquid, if this be sufficiently strong.

Chlorine and bromine have a very powerful action on the hyduret of salicyle, accompanied with a great elevation of temperature and the disengagement of hydrochloric or hydrobromic acids. The whole substance is converted into chloride or bromide of salicyle.

Iodine is abundantly dissolved in hyduret of salicyle, without any action upon it, whether hot or cold. Concentrated ni-

tric acid attacks it strongly, and changes it at first into a yellow, azotated body, *nitrosalicide*, and afterwards into an acid which possesses the principal properties of carbazotic acid. The two products will be described separately.

The most advantageous method to obtain the hyduret of salicyl is the following:—Dissolve, in a suitable quantity of water, four parts of bichromate of potassa, and add to it three parts of concentrated sulphuric acid. On the other hand, prepare a tubulated retort, connected with a receiver, surrounded with cold water; introduce into the retort the quantity of salicin, on which the operation is to be performed, along with six times its weight of water, and apply heat. When the salicin is dissolved, and the solution has attained the boiling point, pour in through the tubulure, by small quantities at a time, the solution of bichromate of potassa and sulphuric acid. At each addition, a quick reaction will be manifest; the mixture assumes a green color, from the formation of sulphate of chromium, in a short time a milky water distils over, holding the hyduret of salicyl in suspension. By rest, the hyduret is deposited at the bottom of the receiver, from whence it may be withdrawn by means of a pipette.

Before entering into the details relative to the composition of the hyduret of salicyl and the compounds derived therefrom, I will dwell for a moment on the circumstances which accompany its production.

We cannot but be struck with the singular difference which is to be remarked between the products which salicin furnishes, under the influence of different oxidating bodies. As I have already said, when treated with sulphuric acid and peroxide of manganese, it yields only carbonic and formic acids. It is the same with a mixture of peroxide of lead and sulphuric acid; but when bichromate of potassa is substituted for the metallic peroxides, the products of the reaction are very different.

An attentive examination of the conditions under which the salicin is placed in these cases, naturally leads to the question, whether the presence or absence of a free acid could modify the nature of the resulting products. When we treat the sa-

licin by a solution of bichromate of potassa and sulphuric acid, all the elements of the reaction are dissolved in the same liquid, so that in proportion as the chromate of potassa is attacked, it yields potassa and oxide of chromium, which, in the quantities indicated, is in amount more than sufficient to neutralise the sulphuric acid. Hence, there is formed sulphate of potassa and sulphate of chromium, which cannot exercise any action upon the organic matters—and the oxygen, in a nascent state, can be regarded as the sole element concerned in the reaction. On the contrary, in the case where salicin is oxidated under the influence of metallic peroxides and sulphuric acid, we may conceive, that in consequence of the insolubility of the peroxides used, the reaction cannot be, so to speak, instantaneous, and the salicin is submitted, during the whole operation, to the simultaneous action of nascent oxygen and a free acid, which, as I shall have occasion to show, converts it into *saliretin* and sugar. The products of the decomposition of salicin becoming, in their turn, oxidated, give rise to carbonic and formic acids. Thus, we may explain this difference, by admitting that in the first case it is the salicin which is oxidated, and in the other the oxygen acts upon the salicin and the sugar.

The following are the experiments upon which I depend to sustain this conclusion:—1. The action which the free acids have upon salicin. 2. I am convinced that saliretin does not produce the least trace of hyduret of salicyl when treated by a solution of bichromate of potassa and sulphuric acid. 3. If we distil a mixture of salicin, bichromate of potassa, and sulphuric acid, as if to prepare the hyduret of salicyl, with the precaution to use more acid than is necessary to form neutral salts with the products of the decomposition of the bichromate, we hardly obtain any traces of hyduret of salicyl, and sometimes none at all; at the same time we may perceive the saliretin produced swimming on the liquid. From this period it is impossible to obtain the least quantity of product.

The hyduret of salicyl, as its name indicates, is such in composition as to be considered as a combination of one equivalent of salicyl with one equivalent of hydrogen. The com-

position of this being $C^{28}H^{10}O^4$, that of the hyduret will be $C^{28}H^{12}O^4$. I have made four analyses by combustion with the oxide of copper on perfectly anhydrous products. To obtain the hyduret in this state, I first rectified it over fused chloride of calcine for twenty-four hours. The oil having been poured off, was distilled, and when one half had passed over, the remainder was obtained separate. It was from this latter that the following results were obtained:

	I.	II.	III.	IV.
Carbon,	69.45	69.11	"	69.44
Hydrogen,	4.86	4.89	4.88	5.07
Oxygen,	25.69	26.00	"	25.49
	<hr/>	<hr/>	<hr/>	<hr/>
	100.00	100.00	"	100.00

This, by calculation, would give:

C^{28}	1070.15	69.26
H^{12}	74.88	4.84
O^4	400.00	25.90
	<hr/>	<hr/>
	1545.04	100.00

According to this, the hyduret of salicyl is isomeric with hydrated benzoic acid.

To ascertain whether, in the state of vapor, the two substances would exhibit a difference in condensation, I ascertained the density of the vapor by the process of M. Dumas. The results were as follows:

Excess of weight of globe full of vapor over same full of air,	0 ^{gr} .421
Volume of globe in cubic centimetres,	233

Temperature of vapor marked by a mercurial thermometer,
230° c. corresponding to 225 of an air thermometer:

Temperature of the atmosphere,	13°
Pressure,	0 ^m .764
Air remaining in the vapor,	0.0
Density of the vapor,	4.276

The density which M. M. Dumas and Mitscherlich each

separately obtained for the vapor of hydrated benzoic acid, is exactly the same as that which I found for the hyduret of salicycle. From this, each volume of the vapor of this latter should contain:

7 of the vapor of carbon,	=2.9512
3 " "	=0.2064
1 " "	=1.1026
<hr/>	
1 " hyduret of salicycle,	=4.2602

the same as crystallized benzoic acid.

Chemistry exhibits few of such perfect cases of isomerism, where two substances, totally distinct, have at the same time a like elementary composition, and a similar condensation of their elements in the state of vapor. We shall likewise see that the combinations which result from the union of the hyduret of salicycle with bases, have the same composition as the corresponding benzoates considered as anhydrous.

According to the theory most generally received by chemists, benzoic acid is regarded as an oxide of a compound radical, benzule. This mode of considering the molecular arrangement of the element corresponds admirably with its reactions, and explains the remarkable stability of this substance, under the influence of the most active agents. The hyduret of salicycle, on the contrary, undergoes considerable alterations with many substances, whence result new compounds, of a very definite composition, and connected by simple relations with this hyduret.

This hyduret does not combine directly with other bodies. Chlorine, bromine, and the metallic oxides, by their action upon it, take away an equivalent of hydrogen, and an equivalent of chlorine, bromine, or metal, taking its place, is added to the other elements of the hyduret. There is consequently in the hyduret of salicycle an equivalent of hydrogen, which may be replaced by an equivalent of another body, and another part which always remains invariable, and which enters into numerous combinations. It is this latter which I regard as a compound radical, analogous to benzule, or rather to cyanogen, and which, to indicate its origin, I call *salicycle*.

The hyduret of salicyle should be a combination of salicyle with an equivalent of hydrogen, and have for its formula, $C^{28}H^{10}O^4 + H^2$. This substance is a true hydracid of a compound radical, as hydrocyanic acid is, and metallic oxides act upon both in exactly the same manner. One equivalent of the hydrogen of the hyduret unites with the oxygen of the oxide, while the salicyle combines with the metal. Thus, we can perceive why the isomerism between benzoic acid and the hyduret of salicyle should be extended to their saline combinations; or in other words, why the anhydrous benzoates are isomeric with the correspondent metallic salicides, $C^{28}H^{10}O^3 + MO$, being $+C^{28}H^{10}O^4 + M$.

From these facts, it results that the hyduret of salicyle is to hydrated benzoic acid as the oxalic acid, $C^4O^4 + H^2$, according to the views of M. Dulong, is to the same body as at present considered $C^4O^3H^2O$.

Metallic Salicides.

Salicide of Potassium.—This combination may be procured with great facility. It is sufficient to mix the hyduret of salicyle with a very concentrated solution of potassa, nearly 45° B. On stirring this mixture with a glass rod, the oil assumes the form of a crystalline mass, which separates from the excess of alkaline liquor. These crystals should be rapidly expressed between bibulous paper, and dissolved in a small quantity of hot alcohol. On cooling, the solution will deposit the salicide in square tables of great regularity.

The salicide of potassium is of a beautiful golden yellow color, greasy to the touch, very soluble in water and alcohol, and has an alkaline reaction. When very dry, it is not altered by the air; but in the moist state, it begins in a few moments with green and finally with black spots. This alteration soon extends to the whole mass, which finally becomes as black as soot. I shall soon have occasion to recur to the nature of this alteration.

Carbonic acid does not alter the salicide of potassium, either

in the dry or moist state. But the greater number of the other acids decompose it by setting force the hydrate of salicide. It is precipitated of a yellow color by the salts of lead, silver, protoxide and peroxide of mercury, manganese, baryta, &c.

The salicide of potassium contains a certain quantity of water of crystallization of which it cannot be deprived without partial decomposition. The water which is disengaged when the salicide is heated is always accompanied by a little of the hyduret of salicyle. This circumstance prevented me from determining exact its water of crystallization.

The salicide of potassium when anhydrous should be composed of one equivalent of salicyle and one equivalent of metal; in fact, by double decomposition it yields insoluble salicides, having this composition, and the remaining liquid is neutral to test paper.

Salicide of Ammonium.—On placing the hydrate of salicyle in contact with concentrated ammonia, the whole becomes a yellow crystalline mass soluble in water. On passing gaseous ammonia through it, the same phenomena results. In the latter case, the salicide of ammonium is presented under the form of yellow needles. This compound, both when in vacuo and in the open air, is rapidly destroyed. Ammonia is disengaged and the oil set free. On this account I was unable to ascertain its composition by direct analysis. But it may be deduced from the amount of ammoniacal gas which is absorbed by a known weight of the hyduret.

Salicide of Barium.—This salt is prepared by double decomposition with a solution of chloride of barium and a concentrated solution of salicide of potassium. The salicide of barium is precipitated as a crystalline powder of a beautiful yellow color. A process is to saturate a hot solution of baryta with hyduret of salicyle; the salicide of barium crystallizes on the cooling of the solution in yellow needles. It is but little soluble in water especially when cold.

I. 0.522 salicide of barium gave 0.292 of sulphate of baryta. On the other hand,

II. 0.650 of the same produced by combustion 0.200 of water and 0.898 of carbonic acid.

From these data this salt is composed of,

	<i>Theory.</i>	<i>Theory.</i>	<i>Analysis.</i>
C ²⁸	1070.16	40.93	41.15 *
H ¹⁴	87.36	3.34	3.41
O ⁶	600.00	22.96	32.57
Ba	856.88	32.77	32.87
	<hr/>	<hr/>	<hr/>
	2614.40	100.00	100.00

To agree with these results, the salicide of barium should contain two atoms of water of crystallization. To confirm this in a direct manner, I determined the amount of loss which the salt underwent by a heat of 160° in a current of dry air by means of the drying apparatus of M. Liebig.

1.237 of salicide of barium, dried in this manner, lost 0.110. This gives for the hundreth—

	<i>Theory.</i>	<i>Analysis.</i>
C ²⁸ H ¹⁰ O ⁴ + Ba = 2389.44	91.4	91.2
2Aq = 224.96	8.6	8.8
	<hr/>	<hr/>
	2614.40	100.0
		100.0

Salicide of Copper.—The best process for obtaining this, consists in agitating a solution of hyduret of salicycle to which recently precipitated hydrate of copper has been added. As soon as the hydrate of copper enters the solution, it changes to a beautiful grass green. This combination is to be thrown upon a filter, washed with alcohol and dried upon a salt water bath. In this state the salicide of copper appears under the form of a green powder, very light, of a slight cupreous and aromatic taste, insoluble in water and alcohol. When heated on platinum foil, in contact with the air, it gives off abundant white vapors, of which a part, condensing on the

*The quantity of carbon given by analysis was but 38.22, but we must add to this quantity that which is retained by the baryta as a carbonate. This latter is equal to 2.23, and the total of carbon will be 41.15.

cold portion of the matter, forms a crystalline sublimate in the form of very small plates with an iridescent reflection.

The result of a first product gave—

I. 0.326 of the matter, 0.082 oxide of copper,

0.466 of the same gave 0.146 water and 0.939 carbonic acid.

A second product yielded—

II. 0.310 of the matter left 0.079 oxide of copper.

0.466 of the same gave 0.144 water and 0.925 carbonic acid.

These results give the following formula :

		<i>Theory.</i>	<i>Experiments.</i>	
			I.	II.
C ²⁸	1070.16	55.50	55.75	54.94
H ¹⁰	62.40	3.24	3.47	3.42
O ⁴	400.00	20.74	20.70	21.30
Cu	395.70	20.52	20.08	20.34
	<hr/>	<hr/>	<hr/>	<hr/>
	1928.26	100.00	100.00	100.00

Salicylic Acid, or Oxide of Salicyle.

The only mode by which I was able to procure this body was by heating the hyduret of salicyle with an excess of potassa. The mixture becomes at first of a reddish brown, but finally loses all color. In the meantime much hydrogen is disengaged, as happens with the hyduret of benzule when treated in the same manner. When the liberation of the hydrogen ceases, the heat is to be withdrawn and the mass dissolved in water, and hydrochloric acid added in slight excess. The salicylic acid precipitates in crystalline tufts, having every appearance of benzoic acid. On dissolving in hot water and cooling, it is obtained in white crystals.

The salicylic acid is slightly soluble in cold water, more so in hot, and very soluble in alcohol and ether. It is volatile without decomposition, and sublimes with great facility. In

this state it crystallizes in long needles, and much resembles sublimed benzoic acid.

It is slightly sweet to the taste, irritates the throat, strongly reddens litmus paper, and decomposes the alkaline carbonates with the disengagement of carbonic acid.

Concentrated sulphuric acid put in contact with salicylic acid, does not produce any change when cold; when heated, the mixture blackens and gives off sulphurous acid.

Concentrated nitric acid does not alter salicylic acid when cold, but as soon as heat is applied a rapid reaction takes place, accompanied with a copious disengagement of gas. At the commencement, the liquor is strongly colored yellow, but in a short time it becomes pale; evaporated to a syrupy consistence, it is almost without color. By rest it deposits small yellow crystals of a very bitter taste. The color of the aqueous solution is deeper than that of the solid matter. This product of the action of nitric acid upon salicylic acid appears to be identical with that obtained by the same means from hyduret of salicylic acid. But of this I am not sure; the smallness in quantity of matter upon which I operated, prevented me from deciding this point.

Salicylic acid contains an atom of water, which it loses when it combines with bases. Its formula is $C^{28}H^{10}O^5 + H^2O$. The following are the results of its analysis:

I. 0.307 of the crystallized acid gave 0.140 water and 0.678 carbonic acid.

II. 0.350 of the same gave 0.140 water and 0.775 carbonic acid.

Which is, in hundredths—

		<i>Theory.</i>	<i>Experiments.</i>	
			I.	II.
C ²⁸	1070.16	61.32	61.16	61.27
H ¹²	74.88	4.29	4.41	4.43
O ⁶	600.00	34.39	34.43	34.33
	<hr/>	<hr/>	<hr/>	<hr/>
	1745.04	100.00	100.00	100.00

I prepared the salicylate of silver by digesting the salicylic acid in an excess of a solution of ammonia, driving off the excess by boiling, and then precipitating with a neutral solution of nitrate of silver; the salicylate of silver falls down as a white insoluble powder. It was then separated, reduced to powder and dried on a salt water bath. The results of its analysis were:

0.420 of the salicylate gave 0.079 water and 0.530 carbonic acid.

0.307 of the same yielded 0.133 metallic silver.

These data give the following as its composition.

		<i>Theory.</i>	<i>Analysis.</i>
C ²⁸	1070.16	34.70	34.91
H ¹⁰	62.40	2.02	2.09
O ⁵	500.00	16.22	16.43
AgO	1451.51	47.06	46.57
	<hr/>	<hr/>	<hr/>
	3084.17	100.00	100.00

Alteration of Salicide of Potassium by the air, and of Melanic Acid.

I have already had occasion to say, that when salicide of potassium, slightly moist, is exposed to the air, it is promptly covered with spots, at first green, but finally black. At the end of a few days, the whole mass becomes black. If the experiment be made over mercury, in a jar filled with oxygen, the metal rises in proportion as the reaction goes on, and the oxygen is finally absorbed. When no oxygen is present, or when this gas and the matter are perfectly dry, there is not any alteration. To facilitate the action, it is necessary to moisten the mass occasionally with a few drops of water.

When the change is complete, the mass presents a carbonaceous appearance. By repeated washings with water, there is left a powder resembling soot. This powder is insipid, insoluble in water, very soluble in alcohol, ether, and the caustic alkalies. Acids precipitate it unchanged from its alkaline solutions. It decomposes the alkaline carbonates, liberating carbonic acid. Heated on platinum foil, it burns without

flame, and leaves no residue. I call this matter *melanic acid*, on account of its color. I prepared the melanate of silver in the same manner as the salicylate of silver. It fell down as a black, heavy powder. I preferred this salt for analysis, to ascertain the composition of melanic acid. It is as follows:

0.500 melanate of silver gave 0.088 water and 0.500 carbonic acid.

0.200 of the same left 0.096 silver.

The composition of melanate of silver, from this data, is:

		<i>Theory.</i>	
C ²⁰	764.40	27.63	27.67
H ⁸	49.92	1.71	1.95
O ⁵	500.00	18.18	18.82
AgO	1451.61	52.48	51.56
	<hr/>	<hr/>	<hr/>
	2765.93	100.00	100.00

The free acid gave from—

I. 0.350 acid, 0.127 water, and 0.722 carbonic acid.

II. 0.325 acid, 0.674 carbonic acid.

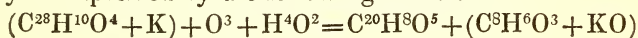
		<i>Theory.</i>	<i>Experiments.</i>	
			I.	II.
C ²⁰	764.40	58.16	57.05	57.40
H ₄	49.92	3.80	4.01	"
O ⁵	500.00	38.04	38.91	"
	<hr/>	<hr/>	<hr/>	
	1314.32	100.00	100.00	

To ascertain what had become of the other elements of the salicide of potassium, I examined the solution obtained by washing the carbonaceous mass with water.

It is perfectly neutral to test paper. It leaves on evaporation a white saline residue, which is deliquescent, and burns on platinum foil, yielding carbonate of potassa. It is not precipitated by the salts of lime or baryta, or by acetate of lead. The nitrate of silver and protonitrate of mercury occasion a white flocculent precipitate. These experiments indicate acetate of potassa. To obviate all uncertainty, I mixed a part

of this solution with a slight excess of sulphuric acid. The mixture was distilled to about four-fifths. The distilled liquid had a feeble odor of vinegar; to this, hydrate of baryta was added in excess, and the excess of baryta precipitated by a current of carbonic acid, and the liquid boiled for a few minutes, and then evaporated. There remained a saline mass, with all the characters of acetate of baryta. On treating this mass with strong sulphuric acid, abundant vapours of acetic acid were disengaged.

From the facts it results, that there is produced from salicide of potassium, by the action of the air, melanic acid and acetate of potassa, and since the quantity of acetic acid produced is just sufficient to neutralize the potassa, it follows that from each atom of salicide there is formed one atom of acetic acid. If to one atom of salicide of potassium we add three atoms of oxygen and the elements of two atoms of water, we will have an atom of melanic acid and an atom of acetate of potassa, as may be expressed by the following formula:



Chloride of Salicyle.

When chlorine is passed through hyduret of salicyle, in the cold, an active reaction takes place with the disengagement of hydrochloric acid. The liquid becomes hot and yellow, and on cooling, after the evolution of the acid gas has ceased, it assumes the form of a yellow crystalline mass. By dissolving this mass in alcohol, perfectly pure chloride of salicyle may be obtained in rectangular tables of pearly appearance.

This chloride is insoluble in water and the acids, but is soluble in alcohol, ethers and the fixed alkalies. This last solution is of a deep yellow, and acids precipitate the chloride from it, unaltered. In this respect it differs essentially from the chloride of benzule, which, under the same circumstances, is changed into benzoic acid. The chloride of salicyle is not altered by long boiling in a concentrated solution of potassa. Heated on a platinum foil, it fuses into a colorless liquid, and then volatilises. Its vapor burns with a flame edged with

green. Heated in a close vessel, it sublimes and condenses in long snow-white needles. Sulphuric acid dissolves it, forming a yellow liquid, precipitating on the addition of water. Its taste is peppery, and its odor peculiar and disagreeable.

The results of its analysis are:

I. 0.456 chloride gave 0.133 water and 0.892 carbonic acid.

II. 0.500 of the same gave 0.156 water and 0.372 carbonic acid.

III. 0.400 of the same gave 0.116 water and 0.778 carbonic acid.

To determine the quantity of chlorine, the chloride of salicycle was decomposed, by passing its vapor over red hot lime.

I. 0.645 chloride gave 0.591 chloride of silver.

II. 0.600 same gave 0.536 chloride of silver.

Its composition, by calculation, would then be:

C ²⁸	1070.16	54.18
H ¹⁰	62.40	3.16
O ⁴	400.00	20.25
Cl ²	442.65	22.41
	<hr/>	<hr/>
	1975.21	100.00

Chloride of salicycle combines directly with alkalies and metallic oxides. The combinations with potassa obtained by dissolving with heat the chloride in a solution of potassa of 45.° B. yields on cooling, a radiated mass of red plates.

It is combined with baryta, by double decomposition with the foregoing salt. It is a yellow, crystalline powder, and seems to be composed of C²⁸H¹⁰O⁴Cl² + BaO. The following result agree with composition:

One product gave for

I. 0.765 mater. 0.273 sulphate of baryta.

0.032 “ 0.627 chloride of silver.

Another product gave for

II. 0.421 matter, 0.204 sulphate of baryta.

Which is in hundredths—

			<i>Experiment.</i>	
			I.	II.
C ²⁸	1070.16	36.50	"	"
H ¹⁰	62.40	2.12	"	"
O ⁴	400.00	13.06	"	"
Cl ²	442.65	15.09	14.98	"
Ba	956.88	32.63	31.91	31.94
<hr/>				
	2932.09	100.00		

Ammonia does not combine directly with the chloride of salicyl, but exerts a remarkable action upon it, which will be separately described.

Bromide of Salicyl.

Bromide of salicyl is made in an analogous manner to the chloride. It crystallizes in small colorless needles. Its properties and reactions with the fixed alkalis and ammonia do not differ from those of the chloride.

By analysis,

I. 0.500 bromide gave 0.117 water and 0.765 carbonic acid.

II. 0.400 " " 0.089 " 0.608 " "

III. 0.582 bromide gave 0.539 bromide of silver.

Giving by calculation—

C ²⁸	1070.16	42.62
H ¹⁰	62.40	4.48
O ⁴	400.00	15.94
Br ²	978.31	38.96
<hr/>		<hr/>
	2510.87	100.00

Action of Ammonia on Chloride and Bromide of Salicyl.

It was ascertained by M. Wöhler and Leibig that by the action of dry ammoniacal gas upon chloride of benzole there is produced, hydrochlorate of ammonia and an azoted compound, benzamide, composed of benzole, and a body N²H⁴ which is found in oxamide and other analogous combinations. The

analogies between the compounds of salicyl and benzole led me to expect that a corresponding compound would be produced from salicyl and ammonia. But the study of this reaction led to unexpected results.

When a current of dry ammonia is passed upon dry chloride of salicyl, it is absorbed, and the chloride becomes yellow, and is in a short time changed into a yellow resinous mass—while water is condensed around the mouth of the tube through which the gas escapes. To render the reaction complete, the mass is to be powdered and submitted anew to ammonia. The yellow mass is then to be withdrawn and dissolved in alcohol, or better in hot anhydrous ether, from which it is deposited in fine crystals with iridised reflection. This I call *chlorosamide*. If before crystallization the mass be washed in cold water, the solution does not contain hydrochlorate of ammonia, and does not affect nitrate of silver. The unpurified and the crystals afford on analysis the same results. From this it results that the ammonia does not take chlorine from the chloride of salicyl, but since water is formed, oxygen is taken away. At first I attributed this to an error of observation arising from an incomplete drying of the materials—I then repeated the experiments with every precaution. The chloride was left in vacuo over sulphuric acid for twenty-four hours, and the ammonia was caused to pass through a long tube containing fragments of caustic potassa. The results were the same; water and chlorosamide were produced.

Chlorosamide is a yellow crystalline matter in small plates, insipid and nearly insoluble in water, which, however, becomes yellow when left in contact with it. It is soluble in alcohol and ether. Anhydrous alcohol does not alter it, but when diluted and hot, ammonia is liberated.

Chlorosamide also possesses the property of regenerating the matter from which it is formed, by appropriating the elements of water. To effect this it is only necessary to heat it in an acid or alkaline solution. When operating in a closed tube, there is in the first case produced a salt of ammonia, and the chloride of salicyl sublimes; in the latter, ammonia is

liberated, and the chloride combines with the alkali. On analysis of chlorosamide—

I. 0.532 of the matter gave 0.165 water, and 1.00 carbonic acid.

The nitrogen was ascertained by the process of M. Dumas.

-I. 0.600 chlorosamide gave 33.5 centimetres of gas saturated with moisture at 15°, pressure 0^m.752.

II. 0.600 gave 33. centimetres saturated at 15.5 pressure 0^m.751.

For the chlorine—

I. 0.600 matter gave, 0.522 chloride of silver.

The formula best agreeing with these results is—

C ²⁸	1070.16	56.52
H ¹⁰	62.4	3.30
O ²	200.00	10.57
N ^{4.3}	118.00	6.23
Ch ²	442.65	23.38
	<hr/>	<hr/>
	1893.21	100.00

Ammonia acts upon the bromide in an exactly similar manner, producing water and *bromosamide*, corresponding in composition with chlorosamide.

Salicin in combination.

I was not able to combine salicin either with acids, ammonia or the oxide of a number of metals; the oxide of lead alone uniting with salicin.

To obtain this compound a few drops of ammonia were added to a hot solution of salicin, and then a solution of triacetate of lead, which caused a copious precipitate; this addition was continued until one-half of the salicin was precipitated. This precipitate was then thrown on a filter and washed with boiling water. The salicinate of lead is a light white powder, both sweet and bitter to the taste. It is soluble in acetic acid and potassa. The acids decompose it readily, setting salicin free. Sulphuric acid produces a red color. It does not lose water when heated to 200°.

I determined the quantity of oxide in the salicinate of lead by the process of Berzelius, and burnt another part with oxide of copper. The results were—

	I.	II.	III.	IV.	V.
Carbon	60.57	60.16	60.02		
Hydrogen	5.68	5.93	5.88	5.08	5.07
Oxygen	33.75	33.91	34.10	"	"
	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00		

I determined the quantity of oxide of lead on four different products:

	I.	II.	III.	IV.
Salicinate of lead	0.612	0.689	0.601	0.543
Oxide of lead	0.167	0.238	0.223	0.044
Metallic lead	0.205	0.187	0.148	0.272

From which data one hundred parts of salicinate contains:

	I.	II.	III.	IV.
Oxide of lead	63.36	63.40	63.03	62.06

As one hundred parts of anhydrous salicin contain 33.92 of oxygen, the proportion of the oxygen in the anhydrous salicin is to that in the oxide of lead, as 33.92 is to 12.25, or nearly 3 to 1.

If this be admitted as the true proportion, the formula for salicinate of lead would be $C^{14}H^8O^3 + PbO$.

But the quantity of water replaced by the inorganic oxide would not be in a simple atomic ratio with the oxide of lead, therefore to avoid fractions of atoms it is necessary to consider the salicinate as a tribasic salt, having for its formula $C^{42}H^{24}O^9 + 3PbO$. Then the formula of anhydrous salicin is $C^{42}H^{24}O^9$ and the crystallized salicin $H^{28}O^{11}$.

Action of Acids.

The action of acids upon salicin has been partially studied by Braconnot. This chemist found that when salicin was dissolved in hot water, acidulated with sulphuric acid, there was deposited on cooling, a matter which, from the form of its cry-

tals, he supposed to differ from salicin. I have examined this body and cannot detect any difference between it and salicin, sulphuric and nitric acids, the alkalies, &c., and analysis affords the same results as with crystals of salicin.

I may, however, remark that this substance is not always produced. I have seen salicin which when thus treated constantly yielded this modification, and some which as uniformly gave the common form of salicin.

Braconnot found, likewise, that concentrated sulphuric and hydrochloric acids changed salicin into a species of resin, which was deposited on the addition of water. I also find that many acids, even when dilute, effect this change, if heated to ebullition, the resin rising to the surface. It is sometimes white, but often slightly yellow, and has all the characters of that obtained by cold concentrated acid. I call this body *saliretin*. It varies in purity according to the purity of the salicin used; the more dilute the acid, the purer is the product obtained.

Saliretin is insoluble in water and ammonia, soluble in alcohol, ether, and concentrated acetic acid. Water precipitates it from these solutions. Potassa and soda dissolve it, but water does not throw it down, while acids, even the carbonic, precipitate it as a white gelatinous mass.

Concentrated sulphuric acid put in contact with saliretin becomes blood red. With strong nitric acid, it is, by boiling, changed into carbazotic acid.

The following analytic results are from a perfectly colorless product:

I. 0.504 saliretin, gave 0.264 water and 1.249 carbonic acid.

II. 0.309 " " 0.168 " and 0.776 " "

III. 0.380 " " 0.947 carbonic acid.

From another product the analytic results were—

IV. 0.369 saliretin gave 0.194 water and 0.973 carbonic acid.

V. 0.413 " " 0.214 " and 1.089 " "

VI. 0.349 " " 0.189 "

From which data the composition in hundredths would be—

	I.	II.	III.	IV.	V.	VI.
Carbon	68.57	68.59	68.09	72.96	72.95	
Hydrogen	5.80	6.02	"	5.83	5.75	6.00
Oxygen	25.63	25.29	"	21.21	21.30	
	<hr/> 100.00	<hr/> 100.00		<hr/> 100.00	<hr/> 100.00	

During the change of salicin into saliretin no gas is disengaged. Atmospheric air is not necessary for this change, for it takes place in an atmosphere of carbonic acid.

Saliretin being much richer in carbon than salicin is, we are tempted to suspect that the change is due to the withdrawal of the elements of water, but as the hydrogen is unchanged, and the oxygen is likewise less, this cannot be the case. From this consideration I was led to seek whether any other substance was at the same time produced. I saturated the acid liquor from which the saliretin had been separated, with recently precipitated carbonate of lead, filtered, and evaporated to dryness. Alcohol digested on this mass, and then evaporated on a salt water bath, left a transparent viscid matter of a sweet taste, soluble in every proportion, in alcohol, but not in ether. Nitric acid changed this into oxalic acid. Left to itself, at the end of two or three days the surface becomes covered with small round opaque spots. After a longer period, each of these becomes the centre of a mamillary crystallization, which finally extends to the whole mass. This substance, dissolved in water and mixed with yeast, undergoes the vinous fermentation. Heated with caustic alkalies, it becomes a deep brown. It results from these reactions that this matter is identical with sugar of grapes. To render this certain I subjected it to analysis with this result—

Carbon,	36.3
Hydrogen,	7.4
Oxygen,	56.3
	<hr/> 100.00

Action of Chlorine.

When a current of chlorine gas is caused to pass through water holding salacin in suspension, solution immediately

commences, and the liquid becomes more or less acid, and of an orange yellow; in time the liquid begins to be cloudy from the formation of a yellow crystalline matter. This substance, separated by the filter, washed and dried, appears in the form of yellow pearly microscopic crystals. It is but little soluble in water, and absolute alcohol; more so in dilute alcohol. Its odor is disagreeable and peculiar, its taste peppery and similar to its odor. Heated in a retort, it fuses into a yellow liquid, and then decomposes, and there distil over, water containing hydrochloric acid, and a colorless oil, leaving a residue of carbon.

This matter, burnt with oxide of copper, gave for—

I.	0.382	matter,	0.142	water,	and	0.500	carbonic acid.
II.	0.500	“	0.200	“	“	0.779	“ “
III.	0.436	“	0.135	“	“	0.765	“ “

Also—

IV.	1.050	matter produced	0.965	fused	chloride of silver.
V.	1.026	“	“	0.968	“ “ “

This composition agrees with the formula—

C ⁴²	1007.24	42.94
H ²⁴	149.76	4.00
Cl ⁴	885.30	23.65
O ¹¹	1100.00	29.41
	<hr/>	<hr/>
	3742.30	100.00

Whence it results, that under the action of chlorine, salicin loses four atoms of hydrogen and gains four atoms of chlorine. If, while the current of chlorine is passing through the water containing salicin, this mixture is kept at the temperature of 60°, a red, oleaginous liquid is formed, and falls to the bottom. This new matter, when cold, has the consistence of turpentine, and an acrid, peppery taste; it is insoluble in water and the acids, but is soluble in alcohol, ether and the alkalies. This matter, previously perfectly dried, yielded on analysis from

I.	0.756	matter,	0.193	water,	and	1.036	carbonic acid.
II.	0.640	“	0.153	“	“	0.888	“ “
III.	0.530	“	0.798	chloride of silver.			

These results agree very well with the formula—

C ⁴²	1607.24	38.61
H ¹⁷	106.08	2.55
Cl ⁷	1549.27	37.22
O ⁹	900.00	21.62

This would seem to indicate that salicin is, during this reaction, deprived of water; and the anhydrous salicin, in its turn, loses seven atoms of hydrogen, which is replaced by seven atoms of chlorine.

Ann. de Chim. et de Phys.

ART. XX.—ON THE PRESERVATION OF VINEGAR.

It is well known that vinegar cannot be preserved a long time, and that in a few weeks, especially in summer, the surface becomes covered with a thick mucus, and the liquid becomes cloudy; as this increases, the acidity lessens, and finally disappears.

There are at present four modes known by which this alteration may be prevented.

The first is to prepare a very acid vinegar; by this means, it is true, it may be preserved many years: but, as persons so seldom make their own vinegar, and for the most part provide themselves from that found in commerce, this mode would be useful only to a few individuals.

The second process consists in concentrating it by means of congelation. A hole being made in the crust of ice and the part not congealed placed in bottles. This operation is very certain; but, one-half of the vinegar at least is lost, although the crust of ice consists almost entirely of water; economical persons would not willingly use this method.

The third process is to withdraw the vinegar from all access of air, by means of flasks or bottles well corked and always

completely filled. Vinegar may be preserved a long time in this manner ; nevertheless this is not much used, because perhaps, when a portion is taken out the remainder is liable to spoil unless the bottle be refilled, for the empty part being filled with air, the vinegar soon becomes thick and tasteless.

The fourth process to preserve vinegar is by distillation ; it may thus be preserved many years unaltered by the action of either heat or air. But, as this is dear, it does not seem that many would adopt this mode, especially when the following is known, which is the most easy of all.

It is sufficient to place vinegar in a well tinned copper, and boil it rapidly for a quarter of a minute, and afterwards carefully bottle it. If any should suppose that the tinned vessel is dangerous for the health, they can put the vinegar in one or more bottles, and place these bottles in a boiler full of water, and thus expose them to heat over a fire. When the water has boiled for a few moments, the bottles are to be withdrawn.

Vinegar thus prepared may be kept for many years without losing its transparency, or spoiling, either by the free access of air, or in bottles only half full ; it may advantageously take the place of common vinegar with pharmacutists in the formation of compound vinegars, as these soon become cloudy, and consequently lose all their ascidity, at least when not prepared from distilled vinegar.

Note.—I prepared in the year 1786 a vessel filled with very weak cider vinegar, to which I had added two ounces of alcohol of 22° Beaume. This vinegar which was at first very weak, was not only preserved, but became as strong as the best Orleans vinegar, and retained its clearness for many years without spoiling, although the neck of the vessel was closed with a simple cone of paper. This vinegar was still in existence when I quitted the college of France, on the occurrence of the revolution.

Journ. de Chim. Med.

ART. XXI.—CASE OF POISONING BY GIN.

March the 17th, 1839.—A lad, of between seven and eight years of age, obtained access to a bottle containing some gin. In about twenty-five minutes after, he appeared to be slightly affected. He was left alone for a space of about five minutes, at the end of which time he was found lying on the floor insensible, with his nose bleeding. He was in such a position as to leave no doubt that he had fallen from a chair near the cupboard, in which was the gin-bottle. The chair did not stand there when he was left alone, and he must have placed it there.

The lad, very soon after he was found, threw some fluid from his stomach, which, according to the statement of his father, smelled of gin. He was put into bed and kept warm, but no medical treatment was adopted.

At 1 o'clock, P. M., (five hours after the spirit was taken,) a medical man saw him. At this time, according to the father's account, the tongue appeared to swell, the child groaned and seemed dreadfully oppressed. The quantity of gin that he had taken was computed at half a pint. An emetic was given, and the child was put into a warm bath, but neither produced any visible effect.

At 3, P. M., (seven hours after the spirit had been taken,) he was conveyed to the Charing-Cross Hospital, where he became my patient, and was seen by me about fifteen minutes after his arrival; in the interim, warm water had been passed into the stomach, and withdrawn by means of the stomach-pump. The fluid had not the odor of gin, nor of any thing peculiar, neither was there the odor of gin in the breath.

The lad was perfectly insensible and motionless; the limbs relaxed and powerless; the face pale; the general surface pallid, and below the ordinary temperature; the pulse very small, feeble, and 144; pupils contracted; the exclusion of light by the hand did not produce dilatation; the breathing was rather slow, difficult, and decidedly stertorous; there was involuntary urging of the stomach, by which a small quantity of fluid and saliva drained from the mouth; this had no peculiar odor. The

bowels had not acted. Whether urine had passed was not known.

The child's general appearance conveyed the idea that he was sinking rapidly, except that the countenance was peculiarly placid, and free from the expression in persons in *articulo mortis*; indeed the face did not correspond with the general symptoms, but formed a striking contrast to them.

He had three leeches applied to each temple, a purgative dose of calomel, a cathartic enema, an application of liquor ammonia to the scalp, a blister behind each ear, and mustard cataplasms to the feet: he had also a mixture of ammonia and camphor. He was placed with his head and thorax raised on pillows.

11, P. M., (fifteen hours after the spirit was taken.) The bowels have been opened, and urine passed, both without consciousness. The scalp red and slightly vesicated; the feet also red from the mustard cataplasm; the leech bites bled moderately; general appearance the same; the breathing still stertorous, but with the addition of mucous rale in the thorax; the irides still contracted; the eyes showing no signs of sensibility, the limbs still motionless and powerless; the skin prone to be cold; nothing elicited signs of consciousness; the pulse rather improved in strength, and still 144; the countenance still free from expression of anxiety, or uneasiness of any kind. The mixture to be continued; the body and extremities to be kept warm; the irritation of the scalp to be encouraged; and the elevated position of the head to be continued.

18th.—Half past 12, P. M., (twenty-eight hours after taking the spirit.)—The general appearance improved; the eyes occasionally opened, the pupils still contracted; no expression in the eyes of consciousness; the face and general surface still pale, and prone to be cold; the expression of the face still calm, free from anxiety, and peculiarly placid; the paleness of the face not of a livid character; the stertor of breathing diminished, but the effusion in the air-vessels of the lungs increased; the mucous rale increased, and extremely audible over the whole chest; the limbs still relaxed; the pulse still

small and rapid. The treatment to be continued, with light nourishment and coffee.

Half past 10, P. M., (38½ hours after taking the spirit.)—The eyes open, still better; the pupils less contracted; the irides more mobile. There is a look almost of consciousness; face and general appearance as at the last visit; the stertor still less; the mucous rale not diminished; pulse rather firmer, still quick, 144.

19th.—Half past 12, P. M., (52½ hours after taking the spirit.) The general appearance at first sight much improved; the eyes open quite well. The lad looks about him with seeming intelligence; and although he does not reply when spoken to, his declining to answer appears to be rather from disinclination than from incapability. The symptoms of coma have subsided in a very marked degree; the stertor still less than yesterday, and reduced to almost nothing; the lungs, however, appear to be even more loaded; the mucous rale extremely loud and general; the breathing rather shorter; cheeks rather flushed; skin generally hot and dry; pulse much more rapid from 160 to 180, but still distinct. He continues to take his medicine, and occasionally some tea and arrow-root. Limbs still relaxed and powerless; shows no sign of volition. In this the contrast is very striking between the seeming intelligence of his look and the inactive state of his will. He does not make the least effort, although he looks as if he could do so without difficulty. Has passed motions and urine since last night, both involuntarily.

4½, P. M. (57½ hours after taking the spirit.)—In nearly the same state as at last visit, except that the cerebral symptoms are diminished, and those connected with the respiration are increased, the lips slightly livid, respiration labored. The mucous rale still more intense, and may be heard by bringing the ear near the chest without contact of the ear or aid of the stethoscope.

To have a blister between the shoulders; rubefacients on the anterior part of the thorax; to continue arrow-root, &c.

March 20th, 3½, A. M. (67½ hours after the spirit,) he died.

Through the whole period there was neither delirium, injection of the conjunctiva, convulsion (or tendency to convulsion,) peevishness, or even anxiety of countenance.

Post-mortem appearances, about twelve hours after death.

External appearances.—The scalp free from any appearances of injury. The surface of the body perfectly natural, and without discoloration. No appearance of injury any where. Expression of face placid.

Head.—On removing the scalp, no unusual redness discovered on its inner surface, nor any on the pericranium.

The dura-mater rather more tense than usual; the arteries more visible; the blood within them rather more florid; in other respects natural.

No morbid adhesions between the dura-mater and the arachnoid. No escape of fluid.

The tunica arachnoidea more than commonly vascular. No coagulable lymph or other product of inflammation. Very slight pearly appearances, but not enough to indicate that inflammation had taken place.

The veins of the membranes distended with dark blood; those corresponding with the temporal regions especially. The veins on the anterior part of the membrane full, as well as those of the other parts; the fulness, therefore, not the effect of gravitation after death.

Base of the Cranium.—On removing the brain, a very small quantity of fluid (serum, tinged with blood,) in the fossæ of the base of the cranium; the quantity so small as to appear to be only what oozed from the vessels during the removal of the cerebellum: it appeared to accumulate during the process, the quantity not exceeding from two to three drachms.

The under surface of the brain natural. Upon making sections of the medullary substance, not more than the usual points of blood, nor indeed more than might consist of a healthy and vigorous state of brain in a child of the patient's age.

The quantity of fluid in the lateral ventricle natural; the vessels rather fuller; the blood within them more florid; the plexus choroides more than commonly full and florid; neither

coagulable lymph, turbid fluid, nor other sufficient sign of inflammation; the left lateral ventricle in every respect like the right; the other parts of the brain, including the cerebellum, healthy in appearance. No odor of gin, or any peculiar odor, in any part of the brain.

Chest.—No effusion or other sign of disease in the cavity of the pleura. The lungs on the parts first presented to view natural; the posterior and under parts dark and congested; the congestion probably commenced prior to death, and increased after from gravitation. There was no disease of the parenchyma. The trachea and bronchial tubes full of frothy, turbid fluid; the lining membrane of the air-passages natural, with the exception of a slight blush at the upper part of the trachea, so slight, however, as not to warrant any inference. The heart quite healthy; contained a small quantity of dark, coagulated blood, with some coagulated lymph. Scarcely a drachm of fluid in the pericardium: this was healthy.

Abdomen.—Neither serum, pus, nor coagulable lymph, in the abdominal cavity. The stomach empty; its outer surface rather paler than usual; no remarkable vascularity of any part; the inner surface uniformly pale, and free from patches or discoloration, except a portion about the size of a child's hand, near the cardiac orifice, with very small vessels visible in and under the mucous coat; the form aborescent; color florid; this appearance, however, only such as is commonly seen, and such as may be the consequence of abstinence, or of the irritation of food; nothing beyond the vascularity of the part that resembled inflammation; the stomach in every other part healthy. The liver healthy. The gall bladder full and distended; the contents natural. Spleen and kidneys healthy. The intestinal canal natural; some parts more vascular and of deeper color than the rest, but still presenting nothing that is not commonly found in most subjects.

Surfaces of the viscera.—On all the surfaces a tendency to dryness. Those of the brain, the lungs, the heart, and the intestines, becoming so dry immediately on exposure to the air, as not to communicate the least moisture to the finger.

London Med. Gaz.

ART. XXI.—DETECTION OF ADULTERATION IN CHOCOLATE.

SOME have asserted that the addition of fecula in the chocolate of commerce cannot be detected by reagents ; basing their opinion upon the assertion of M. Dalh, professor in the University of Kœnigsberg, that 100 parts of cocoa contain 10.91 of amidine or fecula ; but it has been proved by the researches of M. Delcher, pharmacist of Castillon, that cocoa does not contain an amilaceous principle.

A commission appointed by the Board of Health of Paris have made some experiments upon this point, and it results from their trials that the most easy mode of ascertaining whether chocolate contains farina or fecula, consists in treating four grammes of chocolate by 250 grammes of boiling water, filtering the liquid, and adding to the clear liquor an alcoholic tincture of iodine ; this tincture will give a yellowish brown color with the decoction obtained from chocolate without fecula, whilst it will afford a blue color, more or less deep, according to the quantity of fecula present.

The members of the commission caused to be prepared by a manufacturer six specimens of chocolate.

The 1st. contained in each pound 16 gram. of fecula			
" 2d.	16	"	of farina
" 3d.	32	"	of fecula
" 4th.	32	"	of farina
" 5th.	64	"	of fecula
" 6th.	64	"	of farina

They experimented upon these specimens, and distinguished that the blue color obtained by the tincture of iodine in the decoctions from the two first, was modified in that which contained fecula by the yellowish brown color of the chocolate, which did not happen in that containing farina ; that from the the other four, an intense blue color was obtained, but more intense in the fifth and sixth specimens.

Chocolate fully ground, presents, when placed in the moulds, in winter, a clean and brilliant fracture ; on the contrary, in summer, the fracture, under the same circumstances, is uneven

and whitish. This change in the fracture does not indicate any impurity in the chocolate, but is owing to the temperature which causes an alteration in the arrangement of the particles. We may be convinced of this fact by taking a portion with a rough fracture, exposing it to a temperature sufficient to render it soft, placing it in a mould, and, when partially hardened, submitting it to a low temperature ; it will be found, when perfectly cold, to present a smooth and shining fracture.

A. CHEVALIER.—*Journ. de Chim. Med.*

ART. XXII.—BI-MECONATE OF MORPHIA. By P. SQUIRE, Esq.

Mr. P. SQUIRE, impressed with the idea that the combination of the active principle of opium, as prepared by Nature, would prove more beneficial as a therapeutic agent than the artificial salts, instituted a number of experiments, with the view of procuring the bi-meconate of morphia as free of the other ingredients of opium as possible. He has at length succeeded in obtaining a tolerably pure salt, which, from the trials which have been made of it, has fully answered his expectations, as to its superior medicinal power over the other preparations of opium. This salt is given in solution, made nearly of the strength of the common laudanum.

Dr. Macleod, who, at the request of Mr. Squire, made trial of this salt, in his letter to that gentleman thus expresses himself : “ It appears to me a very mild and efficient preparation, rarely producing headach or other discomfort. It has repeatedly answered, in the most satisfactory manner, where opium had disagreed, and has succeeded in some cases where the other salts of morphia (the acetate and hydrochlorate) had failed to give relief.

Mr. Henry Brandon details, in a letter to Mr. Squire, his own case, in which the superiority of this preparation is evidenced. He says, “ I have been a martyr to a spasmodic affec-

tion of the muscles for upwards of fourteen years, and was obliged, after trying every other means in vain to have recourse to opium. I have taken crude opium, laudanum, the aqueous extract of opium, black-drop, *liquor opii sedativus*, and the acetate of morphia, and I declare that not one of them has succeeded so well as the meconate of morphia, which relieves much sooner, and without disturbing the stomach, leaving the system altogether in a more natural state of repose.

Dr. A. T. Thomson in a letter to Mr. Squire, speaks also very highly of this salt of morphia. He says, "I have given a fair trial of your new preparation of opium, the bi-meconate of morphia, which, when separated from many of the other constituents of opium, undoubtedly possesses anodyne properties superior to any of the other salts of morphia in ordinary use."—"I have administered it in three cases in private practice, well calculated to illustrate its properties.

"The first was a neuralgic pain of the left side of the face, extending from the temple to the molar teeth of the upper jaw. It remitted during the day, but returned with frightful severity during the night." Calomel and extract of opium, hydrochlorate and acetate of morphia, black drop, belladonna, extract and tincture of hyoseyamus, extract of aconite, disulphate of quinia, and arsenical solution, were all successively tried without relief. "The strength of the patient was nearly worn out for want of sleep, and under these circumstances your solution was prescribed. Thirty minims were prescribed in a fluid ounce and half of camphor mixture at bed-time. Two hours' sound sleep was procured, and, on awaking, the patient felt the most satisfactory abatement of her sufferings. She was ordered to continue it in doses of eight minims, in combination with fifteen minims of the arsenical solution, every third hour during the day, and to repeat the full dose of thirty minims at bed-time; whilst at the same time the bowels were kept moderately lax. The most gratifying results followed this plan of proceeding; the pain gradually yielded; in less than a week she had comfortable nights, after which the dose of the solution was rapidly diminished, its use discontinued during

the day, and on the third week I had the satisfaction of leaving her perfectly free from complaint.

“The second case was one of wakefulness without any apparent cause. All the usual preparations of opium had been tried without much benefit, and with suffering from headach and nausea on the mornings following the nights on which the narcotics had been given. The solution of the bi-meconate of morphia was given in doses of twenty minims; it effectually procured sleep, and was not productive of the morning distress which had supervened on the use of the other preparations of opium.

“The third case was one of anomalous pain of the hip extending down the thigh, which recurred three or four times in twenty-four hours. The patient had been frequently attacked with rheumatism: and conceiving it to be connected with that disease, the part was cupped, and the guaiacum mixture with small doses of blue pill was prescribed. Little benefit resulted until a week afterwards, when I ordered the part to be blistered, and the denuded part to be dressed with a piece of lint dipped in your solution thrice a-day. The pain rapidly abated, and on the fourth day it was completely gone.

“From the limited experience which I have had of the use of the solution, I am of the opinion that it possesses decided anodyne properties and stimulates less than opium or its tincture; and is much more certain in its influence than any of the artificial salts or other preparations of the day.”

London Med. Gaz., March 9th, 1839.

NECROLOGY.

Bernard Courtois, the discoverer of iodine, died at Paris the 27th of September, 1838, leaving his widow without fortune. If, on making this discovery, Courtois had taken out a certificate of invention, he would have realized a large estate.

Journ. de Chim. Med.

MISCELLANY.

Adulteration of Drugs.—Professor Thomson, in his examination before the Medical Poor Inquiry Committee, stated that the trader sorts the drugs; the purest kind he sells in its natural state, the second kind he reserves for powders, and the worst of all he uses for tinctures, and this inferior kind is very often in a state of decomposition. Frauds are often practised in the drug market. Opium often contains a piece of iron imbedded in it; calomel often consists of a very little more than sulphate of barytes, which is an inert substance; and white precipitate of mercury is sometimes sold as calomel; but in scammony the adulteration is even more remarkable, an immense quantity of chalk being found in it, so that the active ingredient in it often varies from $8\frac{1}{2}$ per cent. to $81\frac{1}{4}$ per cent. Gamboge is often a manufactured article; milk of sulphur commonly contains one-half of stucco, as is proved by exposing the composition to heat. Peruvian bark, as it comes from the hands of the drug grinder, consists of charcoal, with Venitian red, Carthaginian bark, lignum vitæ, and satin wood. Even so late as forty years ago, this composition was made by the Apothecary's Company, and was supplied to the army as Peruvian bark. It is known that on one occasion two chests of the genuine article having been sent to a drug grinder, he put eighteen chests of extraneous matter to the two of pure bark, and sold the remaining eighteen chests to his own profit. Calamine, or carbonate of zinc, as it occurs in commerce, contains very little of zinc at all, consisting principally of sulphate of barytes, colored with a little iron. Ginger is adulterated with 50 per cent. of capsicums, saw-dust, satin-wood, and flour, and sometimes the article sold does not contain more than 30 per cent. of ginger. Jalap is frequently adulterated with 28 pounds of barley meal per cwt., and lignum vitæ dust is sometimes used. Liquorice powder is made of equal parts of common sugar and barley meal, with a little turmeric. Lac and plumbago are adulterated with coal, and opium with an extract of senna, and there is sometimes an infusion of from 30 to 60 per cent. of water. Rhubarb is often made of 14 pounds of flour 8 ounces of turmeric, and 98 pounds of rhubarb; and the article sold often contains no more than one-half of its weight of rhubarb. Nitrate of silver, which is extensively used in medicine, is often adulterated with nitrate of lead. Tinctures are diluted with water. A gentleman, now retired from the

drug trade, was offered any powder he chose for 36s. per cwt., and when the person making the offer was asked if the article was genuine, his answer was, that it was the best he could make at the price, thus showing that the powder might be brought down to almost any price! The druggist himself sometimes sends out the genuine article to the grinder, mixed with a number of foreign ingredients; the grinder, then does his share of the adulteration—so that very little of the genuine article ever reaches the customer! The apothecaries, who are supplied by the chemists, only consider themselves judges of the roots and drugs as they present themselves in the natural state; they do not pretend to be able to apply any chemical tests to the article. Drugs are likely to be procured in their genuine state where the apothecary employs a respectable druggist who grinds for himself. To the knowledge of witness, only two houses in London grind their own drugs. It was his opinion that drugs adulterated as described, were commonly sold to country practitioners, and he thought that the education prescribed to medical men was not calculated to direct their attention to chemistry sufficiently to enable them to detect such frauds. Inasmuch as price is one of the tests by which medicine is purchased, the poor are more liable than others to be supplied with bad remedies. A chemist had urged the witness himself to deal with him, saying, in reference to his prices, that he could supply him with drugs for paupers much cheaper.

Formula for the Internal Administration of Turpentine.

R.	Olei terebinth.	℥iss—ij.
	Magnesiæ carbonat.	℥i.
Tere simul et adde		
	Aquæ menth. sat.	℥v.
	Syrupi limon.	℥ij.
	Spir. lavand. comp.	℥ij.
Misce. sumatur pars quarta ter die.		

Schönidt's Tahrbucher and Med. Chir. Review.

Useful Application to Chilblains.—The following application is strongly recommended to relieve this troublesome affection.

Take of Balsam of Fioraventi,	℥ij.
Solution of acetate of lead,	℥iij.
Olive oil,	℥iij.
Hydrochloric acid,	℥i.

Shake them well together.

The affected parts are to be rubbed once or twice a day with this embrocation, and a piece of silk paper, moistened with it, should be kept constantly applied. The strength of the embrocation may be easily increased or diminished by varying the quantity of oil used in preparing it.

When the chilblain has become chapped and ulcerated, the embrocation is to be applied only to the surrounding skin, and the little wounds should be dressed with laudanized cerate, to which we may sometimes add with advantage a portion of tincture of benzoin.—*Bul. Gen. de Therapeut., et id.*

Case of Poisoning by Arsenious Acid successfully treated by the Hydrated Tritoxide of Iron, by Dr. DEVILLE.—A young lady, in consequence of a disappointment in a love affair, determined to poison herself, and accordingly one night, a little before twelve o'clock, took (mixed in water) a considerable quantity of arsenic powder, which had been bought to destroy rats. The symptoms of poisoning commenced about one o'clock in the morning with vomiting, and she brought up part of the powder with some undigested food. Dr. Deville did not see her before four o'clock, A.M., when she had vomited several times, was suffering dreadful pain in the head and stomach, with burning heat in the throat, and seemed in a very dangerous state. She was immediately given a quantity of milk and linseed decoction, to encourage the vomiting and to assist the discharge of the poison; but this and other means failed to give any relief, and the symptoms became more urgent. Dr. Deville then determined to give hydrated tritoxide of iron; but as he had some difficulty in procuring this, it was half-past five before he returned to the patient. He immediately administered about half an ounce of the antidote by the mouth, and repeated his dose every quarter of an hour, so that by eight o'clock, A.M., she had taken more than half a pound of the iron. He then stopped, as the medicine had produced vomiting and purging, and the urgent symptoms seemed somewhat abated; twenty-five leeches were then applied on the epigastrium, with other general treatment, and the patient gradually recovered. In twelve days she was perfectly well. From a careful examination of the poison which remained in the glass, out of which she had taken it, and from knowing the quantity of the powder originally contained in the packet, Dr. Deville came to the conclusion that 56 grains of arsenious acid had been taken into the stomach, and remained there for above an hour; and though a considerable part (which was thrown away) might have been discharged by vomiting, still a larger quantity, he conceives, remained in the stomach.

[The preservation of the patient's life, in the opinion of Dr. Deville, was incontestibly owing to the hydrated tritoxide of iron; but the case is open to considerable objections, for the greater part or the whole of the poison might have been discharged with the vomited matters, which unfortunately were not preserved.]

Rev. Méd. Fran. et Etran. Sept. 1838.

Toxicological Experiments, with Preparations of Chromium, by Dr. BERNDT.—I. *Experiments with bichromate of potash.* EXP. I. Fifteen grains

of the salt, dissolved in 2 ounces of water, were given to a full-grown rabbit. Five minutes after the animal took food; in twenty minutes the respiration became irregular, and thirst supervened. It now received a second dose of 15 grains, which produced very anxious respiration, and, attempts, as it were, at vomiting, which were rendered abortive by the peculiar structure of its stomach. In about an hour and a quarter, the fore-feet were seized with trembling; in two hours the strength had sunk very much, and there was also incipient paralysis of the hind-feet. Death ensued in two hours and twenty minutes, with convulsions and evacuations of the fæces and urine. The body was examined two hours after death; the jaws were firmly closed; the cerebrum, cerebellum, and spinal marrow were gorged with blood, and somewhat softer than usual; the trachea and lungs were likewise gorged; the heart was flabby, and the right auricle was filled with fluid blood. The stomach was injected, its mucous membrane was partially destroyed, and its contents, when tested, showed the presence of chromium. The intestines were filled with mucus. The liver appeared softened.

Exp. II. A pigeon received 30 grains, made into a pill, with crumbs of bread, in doses of 10 grains, with an interval of half an hour between each dose. Soon after the last dose the animal became rigid, and made ineffectual attempts to vomit. It died in about four hours with slight convulsions. Its body was examined three hours after death; the body was rigid, the brain gorged with blood in a remarkable degree, and it, as well as the spinal cord, appeared softer than natural. The crop was injected, and contained nearly the whole of the pills as they had been swallowed; the stomach contained some chromium; the whole intestinal canal was reddened; the heart was flabby; and the lungs were gorged with blood.

Exp. III. A wound was made in the neck of a moderate-sized bitch, and 30 grains of the salt were introduced beneath the integument, and the wound was then stitched up. Frequent evacuations of the bowels and bladder followed in about a quarter of an hour, and immediately afterwards vomiting and trembling. At first the matter vomited consisted merely of the food; it then became mucous, and after some hours resembled the serum of blood. The usual reagents showed no indications of the presence of chromium. In eight hours the hind-feet were paralyzed, the fore-feet continued to tremble violently. The animal died in eleven hours. The body was examined ten hours after death; it was rigid, and had an unpleasant smell; the wound was dry, whitish, and contained a trace of the salt; the cerebrum, and cerebellum were gorged with blood, and, along with the medulla, much softened. The lungs were filled with blood, as was also the right side of the heart. The stomach and upper portion of the intestinal canal, and the bladder, were reddened, but their contents showed no trace of the presence of chromium.

[Sufficient care does not appear to have been here taken in testing for chromium. The metallic salts, it is known, are capable of forming definite compounds with animal and vegetable substances; and in such cases their presence cannot be detected by the usual reagents. It is necessary to destroy all traces of organic matter before any reliance can be placed upon the indications afforded by the reagents.]

EXP. IV. A dog, three months old, received 4 grains in half an ounce of water. In about half an hour vomiting ensued, and most of the solution was evacuated. The vomiting then ceased; the dog remained for some time very weak, but eventually recovered.

EXP. V. Three grains in powder were given to a frog. (In the experiments with frogs they were placed in water, but not deep enough to cover the head.) Vomiting ensued immediately, and part of the undissolved salt was evacuated; the vomiting, however, continued, and the animal died with convulsions in about an hour. The body was examined immediately; there was no rigidity; the brain and spinal cord were softened; the lungs were dilated and traversed by red vessels; the heart was flabby. The intestinal canal was not much injected, and the contents of the stomach showed the presence of chromium.

EXP. VI. A frog received 2 grains in pills. The consequences were similar to those of Exp. v.

EXP. VII. Five grains were dissolved in 4 oz. of water, and a frog was placed in the solution. In a quarter of an hour it became restless for a short time; in about an hour the restlessness returned, and continued to increase till, in about two hours, it attained its maximum. In eight hours spasms of the hind-feet came on with retching and vomiting. It died in about twelve hours, and the body was examined ten hours afterwards. It was very rigid; the heart was flabby, and like the lungs gorged with blood. The brain and spinal cord were not examined.

EXP. VIII. A frog was placed in a solution containing 20 grains to 4 oz. of water. The phenomena were similar to those observed in the preceding case, but more violent, and death ensued in three hours and a half. The brain and spinal cord were very soft; the lungs small and dark colored, the heart filled with blood. The throat, stomach, and intestines were highly injected.

EXP. IX. A frog was placed in a solution containing 20 grains to 2 oz. of water. The results were similar to, but more violent than those of the two preceding cases.

EXP. X. A frog was kept for forty-five minutes in a solution containing 20 grains to 2 oz. of water. It was then taken out of the solution, washed, and placed in fresh water. The removal produced no change in the phenomena, and the animal died in four hours.

EXP. XI. A solution of 10 grains in 3 drachms of water were injected into the jugular vein of a dog four months old. The animal cried violently

and died instantly. The body was immediately opened: all the blood in the cavity of the thorax was found coagulated; the heart was very much dilated, and its right half continued to pulsate after the left had ceased. The blood in the brain was partially, in the abdomen not at all, coagulated.

II. *Experiments with the chromate of potash.* These experiments were conducted in a similar way to those already related; and the effects of the chromate resemble very nearly those of the bichromate. Perhaps the latter salt is fully more powerful than the former; but the details of the experiments are so much like those we have already given, that we think it needless to enter more fully upon them.

III. *Experiments with the protoxide of chromium.* These experiments merely prove that the protoxide is an inert powder.

IV. *Experiments with substances which it was conceived might prove to be antidotes.* These experiments consisted in first poisoning the animals with the chromate or bichromate of potash, and then giving carbonate of potash, sulphate of iron, or tincture of galls, as antidotes. These substances, however, did not in any way neutralize the effects of the poison, and we need not, therefore, detail the experiments.

Medicinische Zeitung. Nos. 24 and 25. 1838.

Granville's Lotion.—Each kind of lotion consists of three ingredients.

1st. *The strongest liquor of ammonia, A;*

2d. *Distilled spirit of rosemary, B;*

3d. *Spirit of camphor, C.*

Preliminary steps.—A. Saturate a given quantity of distilled water, contained in a glass receiver surrounded by ice, with ammoniacal gas, obtained in the usual way from the mixture of equal parts of hydrochlorate of ammonia and recently slaked lime, both reduced to a fine powder. The water may be made to take up nearly 800 times its bulk of ammoniated gas under the circumstances described; its specific gravity will then be about 872, and 100 parts of it will contain thirty-three parts of real ammonia, according to Sir H. Davy's tables. This solution of ammonia will, therefore, be more than three times the strength of the *liquor ammoniæ* of the Pharmacopœia of London, 100 parts of which, at a specific gravity of 960, contains only ten parts of real ammonia. I have, therefore, called mine "*liquor ammoniæ fortissimus.*"

B. Take two pounds of the tips or small leaves of fresh rosemary, and eight pints of alcohol; leave the whole in infusion for twenty-four hours in a well covered vessel, and after adding a sufficient quantity of water as will just prevent the empyreumatic smell, distil over seven pints. The Pharmacopœia of London directs the essential oil of rosemary to be distilled instead with rectified spirit. Such a preparation I found unsuited for my purpose.

C. To four ounces of pure camphor add two pints of alcohol, so as to

dissolve the camphor, which solution should be filtered. The present *tincture of camphor* of the Pharmacopœia of London, contains one ounce more of that substance, and does not harmonize so well with my two other ingredients as the weaker preparation.

The three ingredients thus prepared, every medical man should keep always ready at hand, in well-stoppered glass bottles, so as to be able to make extemporaneously, a counter-irritating lotion of any requisite strength, according to the nature of the case requiring that application on extraordinary occasions. But for the ordinary purposes detailed in my work, it will be better to keep both a milder and a stronger ammoniated lotion ready prepared for use.

The milder Ammoniated Lotion.—Assuming the quantity of lotion desired to be divided into *eight* parts, then the proportions of the ingredients will stand thus :

A—four-eighths,
B—three-eighths,
C—one-eighth.

The stronger Ammoniated Lotion.—If the quantity desired be also divided into eight parts, then the proportions of the ingredients run as follow :—

A—five-eighths,
B—two-eighths,
C—one-eighth.

Although the changes of proportion here may be deemed trifling, yet the strength of the lotion is such, that I never employ it, except in cases of apoplexy, and for the purpose of cauterization.

Directions in mixing the Ingredients.—A and B are gradually mixed together. The mixture becomes opalescent and somewhat turbid, and a peculiar, highly agreeable, ethereal smell is given out, different from the individual odor of either ingredient, although the extreme pungency of the ammonia be still discernible. I have strong reasons to believe that, at this point of the operation, some particular change takes place, which imparts to the mixture of the two ingredients some of its valuable peculiarities as a counter-irritant, described in my work ; but what that change is, it is not my business to enter upon in this place : suffice it to say, that in a great number of experiments, made with the ingredients separately, (for each of them acts as a counter-irritant on the skin,) and with them combined, the effects were uniformly different ; those in the former case being found unequal to the production of those complete results which I trust I have justly promised to the profession. Ammonia alone (however strong) will not give rise to the effects I have described, though it has often stopped internal pain, and produced *small little blisters* ; but never has it succeeded in almost immediately producing a full vesication, as I have seldom failed to produce with the two ingredients mixed together, particularly after the third ingredient has been added.

Before, however, that third ingredient is so added, it is desirable to clear the previous mixture by the addition of a small quantity of alcohol, and to set the whole in a cool place. All the various precautions here mentioned may, upon an emergency, be dispensed with, when an immediate action is required, either to arrest pain or relieve deep-seated inflammation. But for the more delicate uses, particularly for instantaneous vesication, the preparations should be obtained in the manner I have specified.

The lotion must always be kept in bottles with a glass stopper; and their whole virtue depends on the accurate distillation and preparation of the ingredients, as well as on the careful admixture of the latter. The species of ethereal principle formed during the admixture, remains present in the lotion, but it is apt to vanish if the bottle be frequently opened, and then much of the peculiar effect of the counter-irritation is impaired. It is one of the many recommendations of these powerful preparations, that their effluvia, besides being agreeable, are of precisely that nature which is most likely to revive and benefit the patients laboring under diseases that require the application of counter-irritants. The compound camphor liniment is the only known combination of ingredients nearly similar to the ammoniated lotion just described. But the profession is well aware that the liniment will not produce, and never has produced, the effects I have predicated.

Among those effects, one of the most surprising is that of giving rise, in a space of time varying only between three and ten minutes, and in almost every instance, (if such a result be the desired object,) to as ample and full a vesication as can be expected, in as many hours from the best Spanish flies. This is a result which I am not aware has been obtained before in so short a time, except by boiling water, (a remedy not quite so pleasant as the odor of ammonia;) and on it, therefore, as well as upon its importance in the treatment of many serious disorders, I do take my stand, as also upon that of arresting nervous and muscular pain, almost immediately, provided it does not depend on structural disease."

Lancet and Med. Examiner.

T H E
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ORIGINAL COMMUNICATIONS.

ART. XXIII.—CONVOLVULUS PANDURATUS.

By WALTER SHINN.

An Inaugural Essay.

THIS plant belongs to the Class PENTANDRIA, Order MONOGYNIA, LIN., and to the Natural Family CONVULVULACEÆ, LIND.

Generic Characters. Calyx five-parted; corolla campanulate, plaited; stigmas two; capsule two or three-celled; cells two-seeded.—NUTTALL.

Specific Characters.—Stem twining; leaves cordate, or panduriform, acuminate, lobes rounded; peduncles one to five-flowered; bracts small, at the base of the peduncles; flowers fasciculate, corolla tubular, campanulate.—BECK.

Description.—The root is perennial, very large, cylindrical, spindle-shaped, and marked by longitudinal fissures. It is usually from two to four inches in thickness, and from two to three feet in length, branched towards its extremity, and of an ochre color. PURSH states that, in some instances, it attains to an enormous size; that he has seen one the thickness of a man's thigh. It abounds in a white succulent fluid. "The stem is twining, generally procumbent upon the earth, and not unfrequently climbing upon fences. It is round, and of a greenish-purple color. The leaves are broad, heart-shaped, entire, lobed panduriform, somewhat acuminate, deep green above, and lighter underneath, situated on long petioles

Flowers in fascicles, calyx smooth, awnless; corolla subulate-campanulate, white, with the tube purplish-red at the base, both externally and within. The peduncles and petioles have a common origin, and are arranged in pairs. The flower buds are of a purplish-red hue at first, and, when further advanced, are straw colored. The plant flowers from June to August."—W. P. C. BARTON.

The common name, of *Wild Potato*, which the plant bears, has originated from the appearance of the root. The specific appellation has been given from the panduriform shape of the leaves, which is sometimes met with, bearing some analogy to the fiddle. According to Dr. DARLINGTON, "the specimens with fiddle-shaped leaves have generally a broad, shallow sinus at base, with the calyx often roughish pubescent, and seem, indeed, to constitute a pretty distinct *variety*." They are less common than the others.

Habitat.—It is indigenous to the United States, and extends from Canada to Florida, thriving in sandy soil, in old, uncultivated fields, where it forms a sort of carpeting for the earth, from the luxuriance of its growth and the interlacing of the stems.

Sensible properties.—The root, which constitutes the active portion, is possessed of a disagreeable odor when fresh, and a bitter, acrid taste; these are somewhat diminished by desiccation; by this process about three-fourths of the weight are lost. In the dried state, it is brought to us in circular pieces of different sizes, varying in diameter from an inch to two or more. They are formed by transverse sections of the root, and are composed of two parts; an external corrugated cortical portion, or investing circle, a line or more in thickness; and an internal parenchymatous substance, which is a little depressed upon the flat surfaces, and striated; the striæ diverging from the centre to the circumference. The color is ashen-gray, inclining to brown externally, whitish internally. The structure is compact and somewhat fibrous. Some force is required to pulverize the pieces. The powder is whitish, with an ashen tint. The pieces bear some resemblance to the segments of briony root. By Dr.

B. S. BARTON, we are informed that in Delaware the root is called *kaussauder*, or *kassadar*, which are corruptions of the word *cassada*, most probably negro names. It would appear that the best time for collection is the autumn.

Chemical constitution.—Long as this article of the indigenous materia medica has been known, it does not appear that any experiments have been instituted to determine its chemical constituents, at least, we have been unable to discover that any such attempt has been made, from the means of information at command. It is therefore, with the desire to throw some light upon this portion of its history, that the following essay at analysis has been entered upon. The root employed was collected late in the autumn, cut into transverse slices, and carefully dried in the open air.

Experiment 1st.—A decoction was made by boiling an ounce of the root, well bruized, in a pint of water for fifteen minutes, and straining. It was of a thick, sirupy consistence, of a dull brown color, and possessed the bitter taste of the root, with a slight degree of acrimony. To a portion of this decoction, a small quantity of a solution of iodine was added, which occasioned a deep blue color. With portions of the remaining decoction, a solution of the sulphate of iron produced a blue precipitate. Alcohol, and a solution of subacetate of lead, occasioned white precipitates, and gelatine produced no appreciable alteration.

Experiment 2d.—A tincture was made by macerating two ounces of the bruised root in a pint of diluted alcohol, for two weeks, and then filtering. It was of a clear, bright red color, possessing a bitter, nauseous taste, with a slight degree of acrimony. This tincture, divided into portions, afforded a white precipitate with corrosive sublimate, indicating the presence of albumen, and was rendered turbid by water, from the separation of resin. When evaporated, an extract was formed of a reddish-brown color, which was bitter to the taste, the acrimony of the tincture having been removed by heat.

Experiment 3d.—An ounce of the powder was macerated in four ounces of absolute alcohol for seven days, and filtered. The tincture was of a light yellowish-brown color. A por-

tion of it was evaporated to the consistence of an extract, which was of a reddish-brown color, and, to the taste, very bitter, and somewhat nauseous. Another portion was evaporated to one-half, and water added, which, at first, rendered it milky, but, in the course of a few hours, occasioned a delicate yellow precipitate. The clear liquor was then decanted, and the precipitate set aside for some time, when it became brittle and translucent. To the taste, this was much more nauseous than the extract, but not so bitter. It was soluble both in ether and alcohol, and burned with a yellow flame, emitting much smoke.

Experiment 4th.—An ounce of the powder was macerated in four ounces of sulphuric ether for seven days, and filtered. The solution was clear, and of a yellowish color. Water, when added, rendered it milky, and, when the admixture was evaporated, a yellowish oily matter was obtained floating upon the surface; it possessed a pungent, burning taste. This oily substance was found to leave a permanent greasy stain upon paper, and with a solution of potassa to form a soapy compound.

Experiment 5th.—Five hundred grains of the root were incinnerated, and forty grains of ashes were obtained, which were lixiviated with boiling water and filtered. The clear liquor was evaporated to dryness and a whitish powder obtained, which possessed the property of neutralizing acids. With nitric acid it formed a crystalline salt, having all the properties of nitrate of potassa.

Experiment 6th.—The residue of the last experiment was subjected to the action of dilute nitric acid and filtered. The solution produced a white precipitate with oxalate of ammonia, affording evidence of the presence of lime.

From the foregoing experiments, we are lead to conclude that this root contains the following principles, viz., *starch, gum, gallic acid, albumen, resin, fixed oil, potassa, and lime*; to which may be added, *bitter extractive, lignin, and coloring matter*.

Medical Properties.—Very little specific information is

possessed as regards the therapeutic value of this article. It is known, however, to produce a decided impression upon the alimentary canal, followed by purgative effects. On this account, it has been employed by country practitioners as a substitute for jalap, but compared with this medicine its operation is feeble; it is stated to resemble that of rhubarb. Dr. B. S. BARTON, informs us that, without doubt, it is the *Mechameck*, or wild rhubarb of the Indians. It would seem also to possess diuretic powers, and has acquired some reputation as an antilithic. In cases of calculous concretions, its efficacy has been noticed by Dr. HARRIS, of New Jersey, "who found an infusion or decoction of the root very useful in his own person; he was persuaded that it enabled him to pass the calculous granules with greater facility."

Affinities.—The family of *Convolvulaceæ*, or Bind Weed tribe, to which the plant under consideration belongs, is one of the most natural to be found in the whole list of those which have been brought under classification. The individuals composing it, are so closely allied by botanical resemblances, that no difficulty presents in determining their position, while, at the same time, a uniformity of chemical constitution is so evident in those which have been examined, that a similarity of medicinal property must follow as an ordinary result. To this but few opposing anomalies have presented. The active purgative principle of the family is the *resinoid matter*, which has been found abundantly in the root of the *Ipomœa jalapa*, *Convolvulus scammonia*, *C. mechoacan*, *C. turpe-thum*, *C. scoparius*, and from the foregoing analysis in that of the *C. panduratus*. A similar resin is also reported by DESLONG-CHAMPS to exist in the *C. soldanella*, and *C. althæoides*. With the amount of the resin the activity diminishes or increases. The *C. battatas*, and *C. edulis*, in a cultivated state, are entirely free from it; the former is the common sweet potato. These constitute the sole exceptions. Much of the alteration, however, which these species undergo is no doubt due to soil and climate. In fact, so general is the resemblance, that, when speaking of this family, MURRAY observes, "no other

is more favorable for those who believe in the possibility of judging of the virtues of plants from their exterior conformation.”*

Forms of exhibition.—The root has been administered in powder and decoction, from its little activity; the former may be given in doses of forty grains, or a drachm. The decoction has already been mentioned as a remedy in gravel. It may be made by adding a pint of water to the ounce of powdered root. An extract has been proposed, which, in combination, might be made useful. Such an extract is spoken of by the late Prof. BARTON as little inferior to the scammony of the shops. It is consonant with experiment, however, to suppose that diluted alcohol constitutes the appropriate menstruum.

* We have been informed by Dr. SKINNER, who resided for a number of years, as the Governor of Liberia, on the West Coast of Africa, that he there met with a species of *Convolvulus* having a large root, which possessed properties so active as to produce purging and inflammation of the intestines of hogs, who happened to eat it.

J. C.

ART. XXIV.—OBSERVATIONS ON XEROPHYLLUM SETIFOLIUM. By WILLIAM PROCTER, jr.

THE evidence in favor of the natural method of classifying plants, is becoming every day strengthened by the results of chemical analysis; and while this will be an important agent in rendering that classification permanent, on the other hand analogical reasoning, founded on facts, already the base of that method, will greatly facilitate the chemist in his advance into the comparatively little known region of *Chemical Botany*.

The plant under consideration came to notice, in a chemical point of view, from its association with *Veratrum*, *Colchicum*, &c., in the Natural Family MELANTHACEÆ, suggesting the idea that it might contain a similar principle. The sequel will show that it does contain an *alkaloid*, though it differs in its chemical and sensible properties from *Veratria*.

What the medical properties and power of this plant are, has not yet been determined, though we may infer them analogous to those of the above named genera.

BOTANICAL HISTORY.

XEROPHYLLUM setifolium.

Natural Family MELANTHACEÆ. Class HEXANDRIA. Order TRIGYNIA.—LIN.

Generic characters.—Perianth sub-rotate, deeply six-parted, stamens six, contiguous at base, stigmas three, revolute, partly united below, capsule sub-globose, three-celled, cells two-seeded, opening at the summit.

Syn.—*Helonias asphodeloides*.—LIN.

Vulgar names.—*Turkey's Beard*, *Pond Posey*.

X. setifolium, MICH. Leaves subulate-setaceous, flowers in a crowded raceme with setaceous bracts; filaments broad at base and as long as the corolla; scape leafy. This plant has a perennial root, consisting of a caudex or head, from which emanate many fibres of several inches in length.

Habitat.—It is found in the pine woods of New Jer-

sey and North Carolina; it is peculiar to a sandy soil, and flowers in June. It usually attains the height of three or four feet, and is conspicuous for its head of showy white flowers, which terminate the scape, and, at a distance, give to it the appearance of a long feather. The radical leaves are in thick and bunchy tufts, arranged at their juncture with the root, somewhat in a tunicated manner. From their resemblance to those of the *Gramineæ*, it has received the appellation of *pine grass*.

CHEMICAL HISTORY.

The decoction of the root of the *Xerophyllum setifolium* is of a light brown color, and possesses the taste and odor of the plant. To a portion of the decoction, sub-acetate of lead was added, which produced a very copious precipitate, and the compound of oxide of lead, gum, and starch, thus formed, equalled in weight one-sixth of the root employed.

Tincture of iodine caused the blue precipitate, so characteristic of starch.

Sulphate of iron and gelatine had no action on it.

A portion of the decoction was treated with pure alumine, and filtered, but gave no evidence of gallic acid when sulphate of iron or lime water were added.

A portion of the bruised root was submitted to distillation with water. The distilled liquid had the odor of the root in a concentrated degree, but owing to the limited quantity of root in my possession, the process could not be continued by repeating the distillation, so as to gain ocular proof of the presence of volatile oil, though its existence is highly probable.

A portion of the root was macerated in cold water for twelve hours, and filtered. Bi-chloride of mercury added to this filtered liquid, caused a precipitate indicative of vegetable albumen, which result was confirmed on adding to another portion of the infusion, a solution of ferrocyanuret of potassium, acidulated with acetic acid.

The alcoholic tincture is rendered turbid by the addition of water, and deposits a precipitate on standing.

By evaporation, it yields a resinous extract.

An ethereal tincture was made by digesting a portion of the bruised root in sulphuric ether for thirty-six hours. On evaporating this an oily matter was obtained, which communicated a greasy stain to paper, and was saponifiable.

A quantity of the root, amounting to about five ounces, was macerated in water for forty-eight hours, and then the temperature increased to ebullition. The decoction, thus prepared, possessed the sensible properties of the root. To this, subacetate of lead was added until it ceased to cause a precipitate, then filtered, and the excess of lead separated by a current of hydrosulphuric acid in the usual manner. By these means the decoction is deprived of a large quantity of vegetable matter, and is nearly colorless. An excess of magnesia was then added, and the whole thrown on a filter, to separate the precipitate. This, when dried, was treated with boiling alcohol, and the filtered solution evaporated to dryness. The residue consists of a mass of acicular crystals, agglutinated together by some foreign matter; by redissolving in alcohol, and boiling with animal charcoal, they are deprived of most of their color.

This substance has a marked bitterness, which is sensible for some time in the mouth; has a decided alkaline action on reddened litmus paper, and is capable of saturating acids, and forming with them crystallizable salts. It is very soluble in alcohol and ether, and but slightly soluble in water; nitric acid decomposes it without turning it red.

Combined with sulphuric acid, this alkaloid forms a salt, crystallizing in beautiful tufts of acicular crystals, radiating from a common centre. It is very soluble in water, but less so in alcohol.

The nitrate, hydrochlorate, and acetate, all crystallize, though the latter with difficulty, owing to its disposition to absorb moisture.

From the alkaline nature of this principle, it should be

classed among the vegetable alkalies, and hence deserves the name of *Xerophia*, from the plant.

From the foregoing observations, we may infer that the principal ingredients of *Xerophyllum setifolium* are—1, *gum*; 2, *starch*; 3, *volatile oil*; 4, *resin*; 5, *fixed oil*; 6, *vegetable albumen*; 7, *a peculiar alkaline principle*, styled *Xerophia*.

ART. XXV.—ON THE ADULTERATION OF LAC SULPHURIS.

THE following remarks, on lac sulphuris, are intended to call the attention of pharmacutists to the fact of its frequent adulteration, which, though well known, and easily ascertained, appears not to be sufficiently attended to, as the adulterated article is as frequently to be found in our shops as the pure.

Under the name of lac sulphuris, two articles are imported and vended in this city, with a difference of price which could not obtain, unless the low priced medicine was depreciated in value by some improper means. This, on examination, turns out to be the fact. A number of specimens, obtained from different quarters, on being subjected to a low red heat, were volatilized; some totally, while others so partially as not to appear even to be reduced in bulk, but leaving behind a residue of sulphate of lime, averaging, in several experiments, fifty per cent.

The lac sulphuris being that modification which is recommended as the most to be preferred, it must happen, when this inferior article is used, that the physician is dissappointed in the result of its administration; for if we make due allowance for the 21 or 22 per cent. of water contained in the sulphate of lime, which was driven off with the sulphur at the low red heat used, there will remain even less than 40 per cent. as the amount of sulphur in the preparation.

The pure article ought to be a powder of greenish-yellow hue, possessing but little taste or smell; insoluble in water, and totally vaporizable by heat; when pressed between the fingers it ought, even in small quantities, to communicate a sensation of harshness, arising from friction between the crystalline particles, little to be expected from a powder apparently so minute. This latter circumstance will probably afford an easy means of detecting impurity,—as it cannot be much adulterated when it communicates this sensation on pressure; for when equal parts of the pure and impure commercial variety are thoroughly mixed, by being shaken together, this is rendered almost imperceptible.

The adulterated article is whiter than the pure, and yields no peculiar sensation on being pressed between the fingers, except when in a large lump, and even then the sensation is very slight.

R. B.

ART. XXVI.—ON TINCTURE OF KINO.

By AUGUSTINE DUHAMEL.

THE article kino, as is well known, is disposed, when in alcoholic solution to become gelatinous. This, if not invariably, at least very generally happens by the ordinary method of making the tincture, which is by merely putting the allotted portion of kino in a bottle containing alcohol, which is then shaken a little and set aside for use.

In about a month, or in less time, after this, the tincture will be perceived to have assumed a gelatinous form, unpleasant to the eye, unfit for use, and not susceptible of filtration through paper. To prevent this, various means have been tried. Alcohol, in a diluted state, which was thought to obviate the change, proved of no avail to me. In the case of the exceptions from this change, the substances represented as kino may have been obtained from sources different from

that from which our mart is usually furnished, and varied in character from that generally employed.

There are several varieties of astringent vegetable extracts considered as kino, seven of which are described by GUIBOURT, all more or less soluble in boiling water and alcohol, to which last they impart a beautiful red color. To discriminate between these various qualities, requires an eye familiar with their general appearance. Catechu, broken in very *small* lumps, is sometimes sold and used for kino. This is not liable to gelatinize. It may always be distinguished from kino by being less soluble in alcohol, and wanting the red coloring principle which is developed by this last.

The object of this note is more particularly to observe that the Tincture of Kino, made by the method of displacement, is not liable to gelatinize. All that is required is to bruise the kino, then mix with it some clear sand, and subject it to the action of alcohol in a proper instrument. The result of the elimination will be a deeply colored, but very limpid astringent tincture, containing all the soluble parts of the kino, while a little insoluble residuum alone remains in the filter along with the sand. Some that has been prepared in this manner, more than six months ago, has since undergone no change whatever.

Kino, according to analysis, contains tannin, resin, extractive, and coloring matter.

The first of these is the active agent. By displacement, it appears that all these principles are carried off by the alcohol with the exception of the insoluble extractive, (*apothème* of BERZELIUS,) which is left behind, and to the action of this last substance may we attribute the decomposition of the tincture by long contact with alcohol. The nature of this substance remains to be determined.

ART. XXVII.—OBSERVATIONS ON THE METHOD OF DISPLACEMENT. By AUGUSTINE DUHAMEL, and WILLIAM PROCTER, JR. (*Sequel to the Essay on same subject, Art. I., No. 1, Vol. IV., New Series, of this Journal.*)

IN a somewhat detailed notice of this new process, and its adaptation to the ordinary operations of pharmacy, published in one of the foregoing numbers of this Journal, the attempt was made by one of the authors of this communication to attract the attention of the profession towards some of its advantages, in the expectation that the subject would be followed up by our colleagues generally, and be made the theme of experiment, by which its merits might be properly tested, and accordingly appreciated. But from the little that has been said about it, and the apparent want of knowledge concerning its adaptation, we are sensible that something further is needed. Conscious of this, we have entered upon the present essay, with the view to contribute the sum of our joint experience in the application of the displacement system to some of the most essential preparations of medicines, that are brought into daily requisition; hoping by a candid statement of facts connected with the results, together with the more tangible proofs in the exhibition of the products themselves, to do away with all prejudices, and convince the most sceptical that the great advantages, said to be derived from its employment, are not chimerical.

The superiority of the method of displacement over the usual mode of preparing medicines, as directed by our Pharmacopœia, has not escaped the sagacity of the French pharmacutists. In France, this method has been extensively applied, with almost invariable success, whilst in this country it is hardly known, much less applied.

Impressed with the great advantages which would result from its introduction into American Pharmacy, we feel constrained to make these observations at this time, while it is yet within the power of the revisors of our Pharmacopœia, to

give this method their sanction, by adopting it in general, or recommending it in particular cases, in the work which will result from their labors. We do not wish to be understood as advocating a process because of its novelty, but only on the solid and substantial basis of its own intrinsic merits. We have extensively employed it in pharmaceutical operations, and, consequently, speak from experience. All we ask from those who may undertake a verification of our statements, is the same devotion, care, and precision, in the labor of investigation, which attended our experiments, if they wish to obtain equally definite results. These observations are the more necessary, as the greatest success depends upon the dexterity and attention which may be given to the experiments, for it can hardly be expected that a clumsy operator will, in any instance, draw favorable results.

EXTRACTS.

The best prepared extracts should not be black, but more or less brown in color, except when viewed in mass, and when held up to the light, should be transparent. They should have the characteristic taste, as well as odor, when it possesses any, of the plant used to make the extract, and should not have a burnt taste. A great variety of the extracts in present use, particularly the narcotic, as imported from England, contain a large quantity of chlorophylle, and have a greenish, unctuous appearance; their light green color has given rise to the supposition that a portion of the powdered leaves was incorporated with them. With water, they make a very turbid solution, depositing a sediment upon standing, and leaving a great deal of insoluble matter upon the filter.

In preparing an extract, very large quantities of water are employed in successive boilings, to exhaust the plant of its virtues, all of which must be evaporated, to the detriment of the quality of the products. By displacement, this is avoided, as the substances, by ceding their soluble principles to very small quantities of water, enable you to obtain highly concentrated solutions.

The extracts of narcotic plants, and those which contain volatile oils, both of which require great care in their preparation, particularly the former, are rendered very superior by this process of lixiviation. They are perfectly soluble in cold water, and richer in active principles than those obtained by boiling water or alcohol. They yield transparent solutions, which is not the case with most of those made by heat, owing to the presence of fecula, which is necessarily left behind, when displacement is used, and should any vegetable albumen be present, it is coagulated by the subsequent heat in evaporating, and can easily be separated.

From the results of a number of experiments, the quantity is very little, if at all, inferior to the old method, and the quality, in most instances, is decidedly better. Even *Gentian*, treated in this way, yields an equal amount of extract.

Extract of Chamomile, as thus prepared, is a faithful representative of the plant. We have seen a variety of extracts, of the narcotic class, made by M. BOULLAY, of Paris, by displacement, and while we have tested their ready solubility, we have the most complete evidence of their therapeutic qualities, as tried by our physicians.

Digitalis.—From experiments made with digitalis, we find that 100 parts of the leaves, subjected to the action of water, furnished, by

Decoction and expression,	25 parts.
Displacement with cold water,	24 “
Maceration in alcohol,	31 “
Displacement with alcohol,	30 “
Maceration and displacement with alcohol,	32 “

The product of the displacement treatment, with cold water, yielded a beautiful, translucent extract, brittle, deliquescent, very soluble, and of great activity. The others contained more or less of resin and insoluble matters. By displacement, the first portions of liquid which escaped from the bottom of the funnel, were black, of a sirupy consistence, and of an acrid, bitter taste. Those which followed were

paler in succession, and the last had hardly any color, and no other taste than that of the menstruum.

From the dried leaves of *Cicuta*, *Stramonium*, and *Belladonna*, treated with cold water, we obtained a quantity of soluble extract of pilular consistence, equal, in two instances, to one-fourth of the weight of the substance employed.

The *Compound Extract of Colocynth* can, by this method, be made in thirty-six hours, with very little trouble, whilst, by the old process, seven days are required.

The outline of this process is as follows: the quantity of pulp of colocynth directed by the formula, is bruised finely, placed in a displacement apparatus, and treated with the proper quantity of diluted alcohol in successive portions. So completely does this remove the bitter principle, that the pulp may be chewed without communicating, very sensibly, its distinguishing property to the taste.

The *Aloes*, *Scammony*, *Soap*, and *Cardamum*, are coarsely bruised, mixed with an equal bulk of white sand, and the whole thrown in the displacement filter, and treated with the tincture of colocynth. Before all of the latter has passed, nothing remains in the filter but the sand, impurities, and cardamum pods; finally, evaporate by a gentle heat until the proper consistence is attained.

TINCTURES.

The displacement method applies particularly well to tinctures, which are obtained in an astonishingly rapid and regular manner. Though we do not yet go so far as to recommend it in the indiscriminate preparation of all the tinctures, still, from our experiments with a great number of those made with vegetable powders, we are satisfied that their superiority in strength, handsome appearance, and the readiness with which they can be prepared, claim, for the new method, our decided preference.

The direction attached to the formulæ of the Pharmacopœia under the head of tinctures, is to macerate for a certain number of days, say ten, or more, and then filter through paper. In

the interval this preparation cannot be considered fit for medical dispensation, not having imbibed the whole active portion of the substance. In the mean time, should any be needed, an imperfectly saturated, and therefore unequal preparation must be given, or else the demand be refused; for we question much if there be a single store in the city, where there are two bottles for every tincture, one of which is finished, and the other undergoing preparation.

By using displacement, instead of ten days, or a fortnight, we may have, in as many hours, or less, a clear tincture, replete with all the active principles, so that there can be no delay either in supplying a large order, or forming some new tincture to answer the more immediate call of the physician.

In compliance with the direction of the Pharmacopœia, when the maceration is complete, the whole is thrown upon a paper filter, and left to itself until no more passes through: the residuum upon the filter, without more ado, is thrown away. Mechanical pressure is seldom resorted to, and no attention is paid to the loss, which, in the case of bulky, light, or spongy substances, is very considerable, from the quantity of menstruum absorbed. Let us take, for instance, the *Vinous Tincture of Colchicum Root*, and we will endeavor to show with how much waste the preparation of tinctures is attended. Considerations of economy may possibly urge those to a partial recourse to the displacement method, who, from mere habit, profess an attachment to the ordinary routine.

The Pharmacopœia directs half a pound of the bruised meadow saffron root to a pint of wine, and fourteen days maceration before filtering. The bruised root introduced into the bottle will be found to occupy nearly half its space. The wine next added, and the whole shaken up, will make a thick mixture, which, after being placed at rest for some time, will present to the eye a supernatant liquid, measuring about one-third of the quantity of wine employed, while the remainder is sediment. At the end of the fourteen days, it will be found, after filtration, that what was the pint originally, is now represented by only one-half, without any advantage in strength; the other half,

(no insignificant quantity) is retained by the powder, and though saturated equally with the liquid collected, is abandoned and lost. Sometimes the deficiency is made up with a new portion of wine, which will reduce the tincture one-half in strength. By displacement, the whole of this might be obtained. All that is necessary would be to pour over the dregs, on the filter, about two ounces of wine, and the place of this, when absorbed, to be supplied by additions of water, until the pint of menstruum is made up from the percolation.

The same remarks apply to tinctures from the leaves which largely absorb the liquids.

In displacing one liquid by another of a different nature, especially alcohol by water, to prevent admixture, it is necessary to interpose one or two ounces of the same liquid before adding another. In most cases, it is preferable to use the same menstruum to the end of the process.

Without any previous maceration, we formed tinctures from the leaves of all the *narcotic* class of plants, some of the *diuretic* class, and likewise from the following substances, viz:—

Senna, Lobelia, Rhatany, Opium, Capsicum, Cubebs, Valerian, Rhubarb, Bark, Colocynth, Serpentaria, Hellebore, Ginger, and Galls.

This method answers equally well for the tinctures of animal substances, as *Castor, Musk, and Cantharides.*

TINCTURES OF GUM RESINS.

One of the best results of the displacement application is the the beautiful limpid tinctures, obtained from resinous substances, in a very expeditious manner. The resinous tinctures, made by us in this manner, were those of *Myrrh, Guaiacum, Benzoin, and Assafoetida.*

The coarsely bruised ingredients should be mixed with about half their weight of sand before being placed in the instrument, in the neck of which some clean straw should be closely pressed; then disseminate rectified alcohol by small quantities at the time over its surface. The first portions which pass will be turbid, and should be returned back until the

liquid issues perfectly limpid. *Assafoetida* when thus treated gives a very fine tincture, and, at the same time, relieves us from the inconvenience of a protracted filtration, to which its viscous nature gives occasion.

This class of tinctures, from the uniform character of the substances from which they are made, are more readily formed than the tinctures of roots or leaves. By these means our shop bottles would present a finer appearance, from having no sediment, which, in the case of gum resins, is often very difficult to remove from the bottom of the bottle. We have found displacement an excellent auxiliary in the preparation of some of the tinctures from the vegetable extracts, such as *Catechu* and *Kino*.

The *Acetous Tincture of Squills*, after a long maceration, becomes very difficult to filter. By resorting to immediate displacement, all the desired objects can be obtained at once.

INFUSIONS.

In making infusions it is a desideratum to obtain them transparent, and free from sediment, possessing the properties of the infused substance, and in as short a period as possible. These are not wholly accomplished in the ordinary method, especially in the case of bark, which resumes its opacity after filtration. But, by displacement, these three ends are completely answered; and further, when thus made, the preparations keep longer, being less liable to fermentation from the absence of starch in solution.

The subjects of our essay were principally *Bark*, *Rhubarb*, *Digitalis*, *Belladonna*, *Chamomile*, and *Gentian*.

SYRUPS.

The presence of starch in many syrups is a serious inconvenience, rendering them liable to the fermentative process; notwithstanding they may be saturated solutions of sugar. When made by displacement, however, this is entirely obviated, at the same time that a preparation is obtained possessed of all the virtues of the plant.

We have taken advantage of the concentrative power, offered by displacement, to make some new syrups of great activity, which have been extensively used, and of which we subjoin a notice.

First in order comes *Rhatany*, a substance upon which the Messrs. BOULLAY have made some interesting experiments, proving, in a most satisfactory manner, that the extracts obtained by displacement are vastly superior to those made by the ordinary boiling process.

Syrup of Rhatany.

Take of

Rhatany root in a bruised state, (mashed in a	
mill) or in coarse powder,	1 pound.
Water,	q. s.
Refined Sugar,	2 pounds.

Mix with the root sufficient water to render the whole thoroughly moist; afterwards place it in a BOULLAY's filtering instrument, and operate by displacement with the remainder of the water, until you have obtained thirty-two ounces. Then evaporate, in a water bath, to sixteen ounces, and add the sugar. Form a syrup, marking 31° B., boiling.

This will make one quart of a beautiful and powerfully astringent syrup, containing fourteen drachms of soluble extract,—of which each ounce will contain twenty-six grains.

Syrup of Uva Ursi.

Take of

Uva Ursi	4 ounces.
Water,	q. s.
Refined Sugar,	1 pound.

First bruise the uva ursi, and add a sufficiency of the menstruum to render it thoroughly moist; then place it in a BOULLAY's filtering instrument, and operate, by displacement, until you have exhausted it of all its soluble active principles; this may be known by the last portions of water being nearly devoid of taste and color; then evaporate in a water bath to ten ounces, add the sugar, and form a syrup, marking 31° B.

This gives a pint of syrup, containing about twenty grains to the ounce of soluble extract.

After the above type we have formed a *Syrup of Bark*, containing twenty grains of soluble extract to the ounce; and in the same manner and proportion, *Syrup of Digitalis*, containing 30 grains to the ounce.

Also, *Syrup of Senna*, containing twenty-four grains per ounce.

In like manner and proportions, we have made the *Syrups of Boneset, Buchu, and Pareira Brava*; and though we have not ascertained their relative products in soluble extract, we have found them very efficient preparations. We have made the syrup of *Ipecacuanha* by displacement agreeably to the standard of the French Codex. We have made the syrups of *Sarsaparilla, Rhubarb*, both *simple* and *aromatic*, and *Seneka*, agreeable to the proportions of the United States Pharmacopœia, and have every reason to be satisfied with their quality.

Sarsaparilla furnishes a very fine syrup, and though we have prepared from one to a hundred gallons, none of it has evinced a disposition to ferment. Could we know to what extent the virtues of sarsaparilla are impaired by long boiling, we might form some idea of the advantage to be gained by the displacement method in the preparation of the syrup. As it is, the inconveniences of the old method are so entirely obviated by it, and, moreover, it is so economical, that it can hardly fail to attract attention.

Simple water may be employed in lieu of diluted alcohol, as the menstruum, which is recommended to avoid the fecula; but this being wasted during the evaporation, makes a considerable item of expenditure when the syrup is prepared in large quantities. Cold water, in taking up the soluble active principles, leaves the fecula behind. The liquid, as it ran from the bottom, was very black, and communicated to the taste the peculiar acrimony of the root when good, and the mass of it had the smell of the infusion of this root.

Mel Scillæ Comp., or Hive Syrup.

This diaphoretic and expectorant syrup, so useful in the croup of children, has been the subject of much experiment

among apothecaries, with the view to produce a very active preparation not liable to ferment. As this object is not effected by adopting the process of the United States Pharmacopœia, which is very liable to fermentation, we have long since rejected the method there directed. We have found that water was not the best menstruum for seneka and squill, and that weak alcohol was better suited for the extraction of their virtues. Acting under this conviction, we substituted alcoholic maceration in place of watery decoction, and, after due time, filtered and evaporated it, finishing with the addition of the honey. In this manner we succeeded in obtaining an active preparation, but yet we had not overcome its disposition to ferment. It then occurred to us that the honey was the great obstacle to the attainment of our end, for though we tried various kinds of honey, it was so certain to ferment, after being made two or three weeks, that we could prepare only a small quantity at the time. We then supplied the place of honey by sugar, and our aim was accomplished. Further experiments have led us, as we believe, to the *ultimatum* of success. It furnishes a beautiful syrup, not so highly colored as in the old way, and is very energetic. It acts as a ready emetic when required, while the double dose of such as is commonly made, often disappoints the nurse or physician. When carefully prepared, it will keep a long time without any symptom of fermentation. This is the formula:

Take of

Squill and Seneka, each,	. 2 ounces.
Diluted Alcohol, 18° B.,	. q. s.
Tartar Emetic, . . .	. grs. 32
Refined Sugar, . . .	. 2 pounds.

Put the squill and seneka, reduced to very coarse powder, in a capsule, and saturate with the weak alcohol; a quantity that will just cover its surface will suffice. At the expiration of twelve hours, place it in a BOULLAY's instrument, and operate by displacement until you obtain thirty-two ounces; then evaporate in a water bath to sixteen ounces; add the tartar

emetic, and afterwards the sugar. Then boil a little to form a syrup, marking 32° B. The antimony should not be added to it while in a metallic vessel.

Although the proportions of seneka and squill are but one-half, yet this syrup is stronger than that of the recipe of the United States Pharmacopœia.

Upon the whole, we are satisfied as to the utility of the method of displacement, applied to the greatest number of medicinal agents which are more or less changed by decoction or prolonged evaporation.

We feel satisfied that a long maceration, as directed by formulæ in the case of tinctures, is utterly useless, if not productive of waste with the greatest number, and that by immediate and continued displacement we can extract the virtues of a plant more readily and fully than by infusion, long maceration, or decoction.

By reference to the latest edition of the Codex Pharmacopœe Française, redacted by order of Government, in 1835, we find this principle adopted in a great number of preparations. Among these are the Extracts of Liquorice, Burdock, Bistort, Elecampane, Gentian, Dock, Rhatany, Quassia, Bittersweet, Willow, Wormwood, Digitalis, Blessed-thistle, Borage, Senna, Chamomile, Belladonna, Centaury, Cicuta, Aconite, Hyoscyamus, Stramonium, Rue, Savine, Arnica, Pomegranate, Hop, Cainca, Colchicum, Columbo, Ipecac., Valerian, Sarsaparilla, Seneca, Jalap, Cantharides, Black Hellebore, and a number of others, the use of which is confined to Europe, and therefore of little consequence to mention. Of the above mentioned, some are alcoholic, and some aqueous. They recommend it also in making the essential salt of bark. Also in the entire class of *Ethereal Tinctures*.

In conclusion, we commend the subject to the notice of the revisors of the new Pharmacopœia, trusting, in the hope it may be found worthy their attention, to see it recommended in their coming work.

While upon the subject of the Pharmacopœia, we are led to inquire, from having lately observed a notification in the

public papers of the election of delegates to represent the State of Pennsylvania in the general Convention for revising the National Pharmacopœia, whether any thing has been done by our apothecaries in relation to the contemplated objects of this assembly. Curiosity is awakened in us to know if a committee from the College has been, or is likely to be appointed, to assist in a work which we regard as of the highest utility to themselves, and immediately connected with the interests of their profession. In the same curious spirit we would ask, if they have no suggestions of their own to make in reference to the improvement of some of the processes of the present standard? Whether, as practical pharmacutists, their every day experience in the prosecution of their duties has not convinced them, supposing they have given a fair trial by rigidly adhering to the methods prescribed in the Pharmacopœia, of the possibility of amending some of them with advantage, and whether they have not perceived there were deficiencies, which they, as practical men, could best supply?

The American Pharmacopœia has been of great utility in dispelling some of the mists of ignorance, which at the period of its adoption, in 1820, obscured the knowledge of many important pharmaceutic preparations, and has since paved the way for more enlightened views regarding this branch of science; nevertheless, it cannot be said to have attained perfection; just then emerging from the infancy of the art in this country, it was adequate to all our wants, but our greater experience, and the many improvements and discoveries in medicine since, render us sensible of its defects. It is farthest from our wish to disparage the abilities of the very eminent medical gentlemen, the joint production of whose labors has been a national work, generally recognised as the standard for the various medicinal formulæ employed in the curative art, suited to the wants of an American public, but we cannot refrain from expressing our opinion, that the publication of a work, destined for the use of apothecaries, as a guide for their officinal preparations, needs the assistance of a respectable representation from that body, to give it a character that will

ensure a more rigid adherence to its formulæ by their colleagues. While we would leave wholly to the physician the office of prescribing, we consider that apothecaries are better calculated, from an accustomed familiarity with pharmaceutic manipulation to indicate the manner of conducting the processes which should govern their profession. We are not singular in our opinion. It is the case all over the continent. In Germany, Spain, and in every other country except England, we have precedent before our eyes.

We find a brilliant array of names from the Paris School of Pharmacy, associated with a committee of like number of Professors of the Faculty of Medicine, in the publication of the new Codex. Distinguished Pharmaciens, like BUSSY, CAVENTOU, ROBQUET, PELLETIER, and SOUBEIRAN, who are well known for their active researches in Pharmaceutic Chemistry, by their assistance in establishing new processes, suggesting modifications of old, with the view to economy, or certainty of effect, and their careful revision of the whole matter, have given at once the impress of authority to a work, to which all the apothecaries of France conform. We have not the presumption to assume for ourselves the same level of celebrity with these gentlemen, but we think there might be found some talented and intelligent members of the Philadelphia College of Pharmacy, whose weight of experience might be brought into requisition, and who, we believe, might suggest such improvements upon some of the present formulæ of the United States Pharmacopœia as would enable the framers to devise better.

The inordinate length of this paper admonishes to close here, but the subject, we trust, will not.

ART. XXVIII.—BLACK DROP. By CHARLES ELLIS.

NOTWITHSTANDING the discovery of morphia, and its general introduction into use, there are some Physicians who prefer the old fashioned preparation of opium, called Black Drop.

It becomes important, therefore, to have an article of uniform strength; and that the directions for its preparation should be more in accordance with the modern improvements in pharmacy, than are those which accompany the original recipe. In fact, it could hardly be expected from an adherence to those directions, indefinite and vague as they are, that any certainty in the preparation would be the result. Most of our readers, we presume, are familiar with the old formula, which, with some slight alteration, was published in the first edition of the United States Pharmacopœia. The substitutes which have been offered for Black Drop, with the advantage of greater certainty in strength, are the Acetum Opii of the Dublin, and the Tinctura Opii Acetata of the present edition of the United States Pharmacopœia. But in neither of them are the wishes of those who are partial to this preparation met, as they do not produce the rich acetous syrup of opium which was the product of the original prescription.

The following directions, it is believed, will enable the Apothecary to preserve the formula in all its essential features, and to prepare Black Drop without waste of material, and of uniform strength.

R. —Best Turkey Opium,	℥viij.
White Wine Vinegar,	Oij.
Saffron,	℥ss.
Powdered Nutmegs,	℥iss.
Sugar,	1½ lb.

Rub down the opium with the vinegar, previously made hot; add the saffron, nutmegs, (and if entire conformity with the original be deemed necessary,) ℥j. of yeast; digest them with

frequent shaking, for two weeks. Then throw the whole upon a displacement filter, replacing the liquor upon the ingredients until it passes off clear, which, when entirely drained off, measuring about two pints, set aside.

To the ingredients in the funnel, add, a little at a time, Oiss. of vinegar, which, if done with care, will displace the remaining saturated liquor, and thus deprive the ingredients of all their strength, at least, that it is practical or important to obtain.

The second portion of filtered liquor ought to measure considerably less than a pint, and to be equally clear with the first. To it, is to be added one pound, or if a strict adherence to the original formula is preferred, one and a quarter pounds of white sugar. Dissolve with gentle heat, and evaporate slowly to F. Oj. \bar{z} ij., or to a sufficient extent so as to form, when added to the first infusion, exactly F. Oij. \bar{z} ij. of Black Drop. Thus prepared, it will contain exactly double the quantity of opium in solution, that is directed in the United States Pharmacopœia for laudanum, admitting the menstruum to be sufficient to take up all the strength of the opium.

The advantages which Black Drop, properly prepared, possesses over that by the usual method, must be evident. There is absolute certainty, if the opium is good, of having the preparation always the same; there is no waste of material, and the product is a rich, concentrated, aromatic vinegar of opium, as nearly double the strength of laudanum, as the solvent powers of the menstruum will admit of. More than this cannot be anticipated from following the unscientific directions which accompany the original domestic recipe—of boiling all the ingredients up together, and setting aside in the sun for six weeks.

The uncertainty whether the boiling would ever be twice done to the same extent, the difficulty of filtering the preparation after the sugar has been dissolved in it, and the great waste of material, the product being only about half, constitute insuperable objections to the original method, and were the causes which first directed my attention to the subject.

SELECTED ARTICLES.

ART. XXIX—ON THE INJURIOUS EFFECTS OF THE PHARMACEUTICAL TREATMENT OF DIGITALIS PURPUREA, IN FORMING ITS TINCTURE, WITH A PROPOSAL FOR A MORE EFFICACIOUS FORMULA. By M. DONOVAN, Esq.

THE singular control which Digitalis Purpurea is capable of exercising over the circulatory system has raised it to a high rank amongst therapeutic agents.

Its effects, however, are not always equally energetic, for we frequently find it to disappoint the practitioner; and, hence, very different opinions have been entertained concerning its powers.

Such disappointments have rendered it an object with chemists to discover and isolate the active ingredients in this plant, to ascertain its properties, and to determine the means of producing from it preparations of unvarying medicinal efficacy. With this view, the Society of Pharmacy, of Paris, in 1835, offered a prize of 500 francs for the best answer to the question, "Does there exist in Digitalis Purpurea, one or more proximate principles, to which the medical properties of this plant may be attributed?" Notwithstanding the labor bestowed on the investigation at different times by several eminent persons, the subject is still involved in obscurity. In the absence of precise knowledge of the active principle of digitalis, it will be of use to point out some of the errors in the pharmaceutic management of the plant, which I conceive give origin to many of the disappointments above alluded to; to offer some suggestions as to the mode of prevention; and to introduce such improvements as have been suggested to me

by the labors of those chemists that have investigated the constitution of this important medicine. It is well known to all medical readers, that, about fifteen years since, the existence of an alkali in this plant was announced by M. Leroyer, of Geneva, to which he referred its poisonous qualities. By a process, not necessary here to describe, he separated from foxglove leaves, a bitter, deliquescent matter, which slowly restored the blue color of reddened litmus paper, and which Prévost found to be capable of assuming the form of minute crystals. To this substance the name of digitaline has been given. It possesses the properties of an active poison: a grain of it introduced into the abdomen of a rabbit, in a few minutes began to retard the respiration and circulation; at length the animal, apparently falling into a tranquil sleep, died. A solution of half a grain being injected into the circulation of a dog, killed him in fifty minutes.

Thus this substance undoubtedly contains the active principle; but it has been proved that digitaline is neither a proximate principle, nor of an alkaline nature, as will appear by comparing the experiments of Leroyer, Planiava, Dulong of Astafort, Haase, Planizza, Pauguy, Welding, Brault, and Poggiolo.

Dr. Graves, of Dublin, was the first who called in question the alkaline nature of digitaline, in a paper which he placed in my hands a few months after Leroyer's announcement; and he showed that when certain precautions are taken, this substance does not manifest any alkaline reaction.

M. Dulong, of Astafort, made an examination of foxglove leaves in 1827, which convinced him that they do not contain a peculiar alkali. He arrived at the following conclusions:

1. Digitalis contains a bitter matter, which possesses peculiar properties, and which ought to be regarded as the active principle of the plant.
2. This matter does not present the characters of vegetable salifiable bases.

3. Digitalis does not contain a base analogous to strychnine, although the fact has been asserted in Sweden.

M. Dulong concludes with an important fact, which, however, has attracted but little attention. He found that this bitter active principle of digitalis, forms with infusion of galls an insoluble precipitate. Hence he concludes that watery infusions of nutgalls will act as an antidote to the poison of digitalis especially if used in conjunction with the means already known.* In 1835, the result of the experiments of MM. Brault, and Poggiole was published by these chemists. The following is the substance of their memoir:

We have often (say they) repeated all the processes to prepare this pretended digitaline, and have never yet been able to procure it. The process of M. Pauguy consists in boiling digitalis in distilled water sharpened with sulphuric acid, treating the decoction with calcined magnesia, and the dried precipitate with alcohol. The latter solution, when distilled, will deposit a white crystalline substance in small needles. Without fear of falsehood, we affirm that this process furnishes no product whatever.

We have repeated the process of M. Leroyer different times, and like that chemist we have always obtained a heavy, brown substance, possessing an extremely acrid bitter taste. This is the digitaline of M. Leroyer. Our examination has proved that this is an extract composed of a great quantity of chlorophylle, much resin, a fatty matter, and different salts of lime and potassa. M. Leroyer relates, that M. Prévost has seen crystals of digitaline by the aid of the microscope. We affirm, on the contrary, that these are salts of lime and potash which the digitalis contains.

After these reflections we have nothing to add on the labors of M. Planiava. His digitaline is nothing but an extract, composed nearly of the same principles as that procured by the process of M. Leroyer.

It results from the preceding fact, that the pretended digitaline has never been obtained; that the digitaline of M.

* Journal de Pharmacie, xiii, p. 379

Leroyer is composed of chlorophylle, resin, a fatty matter, and some salt of lime, and potash; and that the process of M. Pauguy furnishes, absolutely, no substance at all.

We may be permitted to believe that digitalis leaves are composed of chlorophylle, resin, fatty matter, amidon, vegetable fibre, gum, tannin, salts of lime, and potash, volatile oil, and oxalate of potash.

We believe, they continue, that the purgative and diuretic effects of foxglove are attributable, not to a peculiar principle, but to the union of all the substances which compose it, and especially to the resin. This resin has a bitter taste, is acrid, and almost corrosive. If one places on his tongue a very small portion of it, he experiences a very painful sensation of heat and constriction in the throat. Two grains of this resin swallowed, irritate the stomach. It is very soluble in warm alcohol; it is soluble in ether and volatile oils; insoluble in water, but soluble in water sharpened with an acid.

In conclusion, MM. Brault and Poggiole observe, that the fecula deposited by foxglove juice, has been very much employed in medicine, because the resin it contains communicates to it the properties of digitalis.*

At a meeting of the Society of Pharmacy, February, 1835, M. Pelletier stated that he had observed and confirmed the most important facts in the foregoing memoir.

From all these investigations, it is plain that in digitalis a principle or combination of principles exists, which in minute quantity, is capable of producing the deadly effects of this medicine. Leroyer says it is an alkaline; Dulong says that it is a bitter principle of a reddish-yellow color, and of an excessively bitter taste; that it softens by heat, and draws into threads like resin, becoming dry and brittle when cold; that it slightly deliquesces in the air, and that it is soluble in water and alcohol, although insoluble in sulphuric ether. Brault and Poggiole conceive that the purgative and diuretic effects depend chiefly upon a resin, but also on the united agency of

* Journal de Pharmacie, xxi. p. 130.

all the other principles. Haase also supposes the resin to be the active ingredient.

In the present state of our knowledge of this subject, it is not in our power to determine which of these views is the correct one; and hence, in the modes of conservation and extraction which we employ, it is prudent to have regard, if possible, to all of them, and not to rely upon any one of them in particular. Thus were we to admit of the statement of Dulong, that the active principle of foxglove is insoluble in either, we must conclude that the choice of ether as a menstruum is improper, that the tincture formed by it is powerless, and that the active principle is excluded. Yet the French Codex, of 1816, as well as that of 1835, directed the ethereal tincture of *digitalis*; so also the Pharmacopœia Belgica, the Pharmacopœia Hannoverana, the Pharmacopœia Regni Poloniæ, (1817,) the Pharmacopœia Borussica, and the Pharmacopœia Saxonica; it is also sanctioned in the Pharmacopœia of Brugnatelli, in that of Cadet de Gassicourt, and of Van Mons. But if we rely on the affirmation of Brault and Poggiolo, that the active principle is soluble in sulphuric ether the foregoing authorities have given adequate formulæ. Again, if the active principle is insoluble in water, as asserted by Brault and Poggiolo, though contradicted by Dulong, the decoction and infusion of *digitalis* of the American and European Pharmacopœias are worthless; and the *tinctura digitalis aquosa æthereæ*, added by Niemann to the Dutch Pharmacopœia, and also introduced into the Pharm. Man. Anvers, 1812, is doubly absurd, as it employs both water and ether.

In place, therefore, of relying on this or that authority, when they differ so widely as to the principle on which the medicinal powers depend, the more prudent course will be to use such process of extraction only as will deprive the subject of the greatest number of its principles, care being taken that none of them shall be excluded, unless such as are manifestly inert.

In the following observations, I shall confine myself to the

consideration of the tinctures of digitalis at present in use, reserving other preparations for some future communication.

The alcoholic tinctures of the pharmacopœial processes vary in the strength of the alcohol. In the British isles, however, that made use of is proof spirit. Let us, therefore, inquire how far this menstruum is effectual, and whether the previous treatment of the plant occasions important changes in its powers. The first step towards forming the tincture is to dry the leaves, and this process is differently directed by the colleges. We have no experiments on record of the results of various methods of drying; we are, therefore, left to draw our conclusions from analogy.

We know that in the case of some active medicines, drying, especially by heat, effects considerable changes. White briony, a highly acrid and poisonous substance when recent, becomes comparatively mild by drying; and I have found that its chemical constitution is so far altered, that although an infusion of the fresh root affords a precipitate with tincture of galls, the infusion of the root, dried, even without heat, does not. The recent root of *Arum maculatum*, if chewed, will blister the mouth, and if rubbed on the hands will excoriate them; yet, when dried, it is not only innoxious, but is used as an article of food.

The bitter cassava root "when raw, is a most fatal poison to man and beast; but prepared by fire (baking) it is very safe, and the natural bread of the Indians and several Europeans."*

Garlic is highly acrimonious; by drying it loses this quality, the same observation applies nearly to the whole onion tribe. The acrid seeds of the *Palma Christi* become mild by drying. Mezereon bark, if applied to the skin, while recent, raises a blister; but by drying, it loses this quality.

Many other instances might be adduced; it is true that they prove nothing in the case of digitalis, and they may be opposed by the known efficacy of digitalis powder when well pre-

*Stedman's Narrative, p. 382.

served. But do they not render it highly probable, that were it not for the injurious effects of drying, this plant might be much more active, much less liable to disappoint the practitioner than it is well known to be, and, perhaps, universal in its control over all constitutions?

Several more direct evidences may be adduced in support of the opinion that the powers of the growing plant are different from those of the dried leaves. When first taken from the ground, the leaves are strong, erect, and vigorous; in a short time, an hour is sufficient, they become collapsed and limber, lose their firmness, grow flaccid and droop. This is the first symptom of change. If an adequate heat be now applied, the smell of the plant is extensively diffused throughout the apartment, which proves the dissipation and loss of some ingredient of the leaves, probably the volatile oil. The brilliant green color on the surface is also changed for a dusky olive. It is not easy to conceive, that such striking changes in the physical constitution of the plant can take place without some modification of medicinal power. But if to these sources of change, we add that arising from the very bad mode of drying which the Pharmacopœias inculcate, it can scarcely be considered doubtful, that much injury is sustained. The Dublin Pharmacopœia directs the herb to be enclosed in paper bags, exposed to 90° or 100° for an hour, and then dried on a wire gauze. The London Pharmacopœia orders the leaves to be lightly stewed and hastily dried by a gentle heat. The Edinburgh Pharmacopœia merely desires, that such small quantities as can be hastily dried, shall be exposed to the moderate heat of a fire hearth; and adds the following test: "*sienim eorum vires optime servantur, cujus indicium est color nativus quam perfectissime constans.*"

This preservation of the green color is universally admitted as the test of good drying; and when the green color is destroyed, it is conceived that the medicinal efficacy of the subject is not to be relied on. It is a convenient test, for without it we should in every case have recourse for proof to the actual exhibition of the medicine.

Now, by the process of the Dublin Pharmacopœia the color is exceedingly impaired. There can be nothing more detrimental to it than the heating for an hour in a bag, at the temperature of 90° or 100°. I have over and over convinced myself, by processes much varied, that to allow the steam of the leaves to act upon them for so long a time, or at all, is injurious to color. I have dried these leaves sometimes in paper bags before the fire, or in the sun, or air, sometimes in a baker's oven, sometimes stratified on a wire gauze over a sandbath, or on a floor in the shade, and have sometimes hung them in bundles in a room, in which burned a fire; yet in no case did I ever, by these processes, preserve the brilliant green in the leaves, which it is their nature to retain under a different management. Yet these are all the methods directed in the Pharmacopœias, and practised by herb dealers, druggists, and apothecaries. For proof of the injury done by these methods of drying, I refer to the powder of foxglove, procurable in commerce, the color of which is far inferior to that which it is possible to obtain by adopting the process which in some future communication I may describe.

It appears, therefore, that every step, from the collection to the drying, occasions deterioration. The softening of the substance of the plant when pulled, the expulsion of the volatile oil, or other odorous substances during drying, and the change of color, owing to bad methods of exsiccation, are the sensible evidences of deterioration, and they are strengthened by the analogies which have been adduced. If to these injuries we add that arising from long delays, generally a week, nay, often a fortnight, from the first collection to the final drying, there can be little doubt that the plant sustains a great deal of injury.

The following observations of a competent judge, correspond with the opinions here entertained: "*Comme par le dessiccation, certaines plantes perdent une partie de leur principes les plus volatils, ou subissent des modifications dans leur nature intime, il est certain que leur action medicale ne doit pas etre la meme qu'avant leur dessiccation. On doit en*

conclure qu'il est des teintures que ne jouissent pas toujours des propriétés primitives des substances dont elles sont composées. Ce fait est d'autant plus à considérer, que depuis que dessiccation des plantes a été en grande partie confié à des personnes étrangers à la pharmacie, ces substances sont livrées au commerce dans un état de détérioration véritablement pénible à constater."*

If two tinctures be made, one with proof and the other with rectified spirit, on equal quantities of the same coarse powder of foxglove, the former will, after equal digestion, be brown, and the latter a brilliant green; the taste of both will be exceedingly bitter. If the residue of both be filtered off, and an equal quantity of rectified spirit be digested on each, the residuum of that on which proof spirit had been previously digested will afford a brilliant green tincture, and the other a tincture of pale hue. Thus the green matter of the leaf is but little soluble in proof spirit, although largely soluble in rectified spirit. We do not know whether this is merely chromulite, or whether it is this substance, combined with the active principles, if there be more than one; and hence, in this state of uncertainty, it is prudent to retain the green matter. The resin, which is supposed by some to be the medicinal agent, the essential oil, the fixed oil, the fatty substance, and the bitter principle, are all soluble in rectified spirit; but we are not so certain that they are equally soluble in proof.

This point settled, the plan which I propose is easily executed; it requires no skill, and can scarcely fail, if common care be taken. It consists in plucking the proper leaves off the living plant on the spot where it grows, instantly throwing them into the strongest alcohol, digesting for six weeks, pressing out the tincture, and filtering it. Here all the sources of deterioration are obviated, and we preserve the virtues of the recent plant unimpaired.

The ratio of the recent plant to the rectified spirit may be so contrived that the resulting tincture shall correspond with

*Bulletin des travaux de la Société de Pharmacie de Paris Octobre, 1830.

the ratio of the dried plant to the proof spirit as indicated in the Dublin Pharmacopœia. I found, from a mean of four trials, that 100 grains of digitalis leaves, of a moderate size, gathered in dry weather, and immediately dried in a well-regulated fire-heat, lost seventy-nine grains of water. The same experiments made on small leaves proved a loss of eighty-three grains for every hundred.

Thus the mean loss of leaves of a moderate and small size, is eighty-one grains, on every hundred; and the numerical strength of the dried leaves is to that of the recent as five one-quarter to one. Hence ten ounces and a half, Troy, of the recent leaves, would be equivalent to two ounces dried; and there would remain eight ounces and a half by weight, that is 8.94 ounces by measure of water. If to this quantity of water contained in the recent plant, we add 8.74 ounces of alcohol, (0.814,) we shall have seventeen ounces and a half, by measure, of proof spirit, allowing for condensation, (instead of sixteen ounces indicated in the Pharmacopœia for two ounces of dried foxglove,) which is one ounce and a half too much. But if ninety grains of powder of foxglove be added, the whole will be of the pharmacopœial strength, so far as ratio of the ingredients is concerned. But the quantity of liquid being inadequate to cover the leaves, the bottle containing the ingredients should be digested for a month, one day standing upon its bottom and the next inverted on its top. The resulting tincture will be of an olive brown color, because the red coloring matter observed by Welding will only be dissolved, and the chromulite will not. This must happen while we adhere to the ratio of the Colleges. But we can obtain a brilliant green tincture by regulating the ratio so that the menstruum will be reduced to the strength of rectified spirit, (0.840.)

In order to do this, let ten ounces and a half, Troy, of leaves be pulled from the growing plant, and plunged into a bottle, containing two pints and three-quarters (wine gallon measure) of alcohol, 0.815. The strength of the alcohol will be reduced by the water to the strength of rectified spirit,

(0.840,) and, after the proper digestion, a brilliant green tincture will result, as perfect as it is possible to procure it. The strength of this tincture, compared with that produced by the process of the Dublin Pharmacopœia, will be, so far as ratio is concerned, as one to three, and hence it might be given in three times the quantity for a dose. But as there is every reason to believe that its strength is incommensurate with this ratio, it might be prudent to begin with the same doses as have been always employed.

In this case the leaves will be covered by the alcohol; but a month's digestion in a warm place will be required, with frequent agitation.

The defects of the tincture of digitalis, made according to the British Pharmacopœias, have been fully appreciated in other countries, and we find that efforts have been made to remedy them. The ethereal tincture of the Codex Français, (both 1816 and 1834,) as well as of some other continental Pharmacopœias, is, perhaps, intended to obviate an inefficiency of the British formulæ, but the solvent power of ether on the active ingredient is rendered very doubtful by the contradictory statements which have been made on this subject.

The Dresden Pharmacopœia contains a formula, the object of which seems to be the attainment of the same advantages as are contemplated by mine. The recently expressed juice of foxglove is to be mixed with an equal weight of spirit of wine, and the mixture filtered. But the foregoing pages contain my reasons for believing it doubtful that the juice possesses all the qualities of the leaves; and that if it did, the feeble alcohol employed would not be competent to hold them dissolved. A formula for the preparation of tinctures of this kind has been given in the Bulletin des Travaux, de la Société de Pharmacie, for 1830.

In conclusion, I am compelled to believe that our tincture of digitalis is far from being the best preparation of which the plant is susceptible, and I suggest to practitioners a trial of the process given in this communication. This trial should

not be made by apothecaries in compounding prescriptions of physicians or surgeons; they are bound to the pharmacopœial process, and it would be great impropriety in them to substitute any preparation of a more active nature than is there indicated, unless with the full knowledge and approbation of the prescriber.

Dublin Journal of Medical Science, May, 1839.

ART. XXX.—ON THE PRECIPITATION OF THE PRINCIPAL METALS, BY MEANS OF SULPHURETTED HYDROGEN, FROM SOLUTIONS ACIDIFIED WITH HYDROCHLORIC ACID. By M. HUGO REINISH.

IT has been hitherto believed that the salts of zinc, iron, manganese, cobalt, and nickel, were the only combinations not precipitated by sulphuretted hydrogen, from strongly acid solutions, whilst all other metals were thrown down and changed into sulphurets, even from solutions very strongly acid. I undertook a series of experiments for the purpose of ascertaining, the correctness of this opinion, and discovered that many metals, such as lead, tin, and platinum were not precipitated by sulphuretted hydrogen, when their solutions were strongly acidified, especially with hydrochloric acid.

If one part of the neutral acetate of lead be dissolved in 200 parts of water, and to a portion of this solution, 25 per cent. of its weight of hydrochloric acid, of the density of 1.168 be added, there will form, at first, a small precipitate of chloride of lead, since this salt is but slightly soluble in hydrochloric acid. If afterwards we pass through the liquid a current of sulphuretted hydrogen, no precipitate will be perceived; but if a few drops of this solution be let fall into water, an abundant precipitate of sulphuret of lead will immediately be formed. Hence it is very possible that in many analyses a

small quantity of lead has not been detected, because the liquors were too acid. This property of the salts of lead affords an easy means of separating this metal from small quantities of arsenic, copper, silver, antimony, or mercury, as these are completely precipitated in very acid solutions.

If to the before mentioned solution (1 acetate of lead and 200 water) we add 15 per cent. of its weight of hydrochloric acid, it is not precipitated by sulphuretted hydrogen, but when a little water is added, an abundant precipitate of sulphuret of lead is immediately thrown down.

The same solution mixed with 10 per cent of hydrochloric acid gives, with sulphuretted hydrogen gas, a fine red precipitate, which retains its color, and is a sulphochloride of lead.

Mixed with only 5 per cent. of hydrochloric acid, this solution of acetate of lead gives, with sulphuretted hydrogen, a precipitate, at first red, but which soon becomes brown, and, finally, black.

A solution, containing one part of acetate of lead in 500 parts of water, acts in the same manner with sulphuretted hydrogen, as that containing one part of acetate of lead in 200 of water, when the two solutions are acidified with the same quantity of acid, except that when the solution $\frac{1}{500}$ contains 10 per cent. of acid, it is still precipitated red by sulphuretted hydrogen; but the red precipitate is not permanent, and with 5 per cent. of hydrochloric acid, the solution $\frac{1}{500}$, affords at once a black precipitate with sulphuretted hydrogen.

Tin presents, under these circumstances, an interesting property. Since this metal is not precipitated by hydrochloric acid, we can render the solutions much more acid than those of lead, and thus accomplish its thorough separation from other metals, such as arsenic.

One part of prochloride of tin dissolved in 100 parts of water, was mixed with twenty-five of hydrochloric acid, and the solution treated with sulphuretted hydrogen. At first there was no precipitate formed; but in the course of time the

liquid became troubled. The same solution, with 15 per cent. of hydrochloric acid, was immediately precipitated.

A solution of protochloride of tin, $\frac{1}{100}$, acidified with 40 per cent. of hydrochloric acid was not precipitated by sulphuretted hydrogen. But when the solution, saturated with the gas, was thrown into water, a precipitate of sulphuret of tin was immediately formed. A solution of tin, $\frac{1}{50}$, mixed with 50 per cent. of acid is precipitated by sulphuretted hydrogen. A solution of $\frac{1}{500}$ acts exactly like that of $\frac{1}{100}$.

A solution of perchloride of platinum, $\frac{1}{100}$, mixed with 25 per cent. of hydrochloric acid is not precipitated by sulphuretted hydrogen.

A solution of chloride of gold, $\frac{1}{5000}$, mixed with 50 per cent. of hydrochloric acid, is scarcely troubled by sulphuretted hydrogen. A solution of $\frac{1}{10000}$ mixed with 50 per cent. of acid, does not exhibit any reaction.

A solution of potassa and tartrate of antimony of $\frac{1}{10000}$, mixed with 50 per cent. of acid, is slightly disturbed by sulphuretted hydrogen. A solution of $\frac{1}{15000}$ is still colored yellow; and finally a solution of $\frac{1}{30000}$ does not exhibit any reaction.

Acetate of copper, in a solution of $\frac{1}{10000}$, mixed with 25 per cent. of hydrochloric acid, is precipitated in a very decided manner. In a solution of $\frac{1}{15000}$ with 50 per cent. of acid, it is even yet slightly troubled; but a solution of $\frac{1}{40000}$ with 50 per cent. of acid, does not present any appearances of reaction.

One part of fused nitrate of silver was dissolved in 15.000 parts of water; hydrochloric acid was added, and immediately a precipitate was formed, which redissolved in the excess of acid. This solution, containing 50 per cent. of acid, gave, with sulphuretted hydrogen, a very notable gray precipitate. A solution of $\frac{1}{25000}$ was even yet precipitated in a sensible manner. A solution of $\frac{1}{30000}$ was still slightly troubled. Finally, in a solution of $\frac{1}{60000}$ no effects were produced.

One part of arsenious acid, dissolved in 20.000 parts of water, was acidified by 50 per cent. of hydrochloric acid. This solution, submitted to sulphuretted hydrogen, gave a

notable precipitate. A solution of $\frac{1}{30,000}$ was very sensibly disturbed. Appearances of reaction did not cease except when the solution was $\frac{1}{120,000}$, acidified by 50 per cent. of hydrochloric acid. The solution of $\frac{1}{30,000}$ was not troubled by the sulphuretted hydrogen when acidified by a much greater quantity of the hydrochloric acid.

J. d' Erdman and Annales des Mines.

ART. XXXI.—NEW RESEARCHES UPON THE COMPOSITION OF THE ORGANIC ALKALIES. By M. V. REGNAULT.

THE organic alkalies have been examined by many distinguished chemists, and their composition has been principally studied, in latter times, by M. Pelletier, Dumas, and Liebig, M. Liebig, has arrived at this extraordinary result, that all the organic bases, contain, in each atom of base, two atoms of nitrogen, and that their capacity of saturation is consequently the same as if the nitrogen existed in the state of ammonia in combination with a body which does not alter in any respect its combining power. This law which regulates the composition of vegetable bases, has been established by a great number of analyses, and is generally admitted by all chemists.

Nevertheless, if we examine, with attention, the series of salts which these bases form with acids, we will soon perceive very singular anomalies. Thus, for example, the sulphates of quinia and cinchonia, obtained by saturating these bases with dilute sulphuric acid, will be subsalts, as well as the salts obtained by dissolving them in chloric and iodic acid. The hydriodates of strychnia and brucia, obtained by dissolving these bases in an excess of hydriodic acid, or prepared by double decomposition will be, according to the analyses of M. Pelletier, sesquibasic salts. The hydrochlorates of cinchonia and quinia, obtained by dissolving these bases in an excess of hydrochloric acid and crystallising, will be bibasic salts.

The anomalies appeared so remarkable as to induce me to undertake new researches on the composition of the organic alkalies.

My researches demonstrate that the law of composition which M. Liebig believed that he had discovered in this class, and which has been generally admitted, is not exact. These bases do not always contain two atoms of nitrogen; many of them possess four atoms. Their capacity of saturation is consequently not the same as if the nitrogen existed in the state of ammonia.

All the vegetable bases, extracted from opium, contain two atoms of nitrogen, whilst those of the cinchonas and strychnos contain four atoms.

The method, equally simple and ingenious, pointed out by M. Liebig, to determine the capacity of saturation of the organic alkalies, and which consists in saturating a known weight of the perfectly dry base, with hydrochloric acid gas, and determining the increase of weight, will lead to exact results; but it requires to be conducted with great circumspection, the greater number of the bases being capable of absorbing a quantity of hydrochloric acid gas much greater than is necessary for their saturation. They do not abandon this excess of acid in vacuo, but only at a very elevated temperature, and that most frequently exceeding 100°. Some of them, as, for example, quinia and cinchonia, are decomposed previous to being reduced to the state of neutral hydrochlorate. In all these cases it is proper to verify the atomic weight obtained, by analysing a neutral salt prepared *via humida*.

The formulæ of the principal organic bases are, according to my analyses, as follows:—

Morphia,	$\text{H}^{40}\text{C}^{35}\text{N}^2\text{O}^6$
Codeia,	$\text{H}^{40}\text{C}^{35}\text{N}^2\text{O}^5$
Narcotina,	$\text{H}^{40}\text{C}^{44}\text{N}^2\text{O}^{13}$
Quinia,	$\text{H}^{48}\text{C}^{40}\text{N}^4\text{O}^4$
Cinchonia,	$\text{H}^{46}\text{C}^{40}\text{N}^4\text{O}^2$
Strychnia,	$\text{H}^{44}\text{C}^{42}\text{N}^4\text{O}^4$
Brucia,	$\text{H}^{52}\text{C}^{46}\text{N}^4\text{O}^8$

The researches which have been hitherto made upon the salts which the vegetable bases form with the oxacids, appear to prove that these salts, or, at least, many of them, may be obtained in an anhydrous state. Thus, according to M. Baup, the sulphates of quinia and cinchonia lose all their water of crystallization at 120° and remain completely anhydrous. It is the same with the sulphates of strychnia and morphia according to the analyses of M. Liebig. This latter chemist, admits, on the contrary, that the dried sulphate of quinia contains two atoms of water. The analyses of Serullas and M. Pelletier upon the chlorates and iodates, appear to show that these salts loose all their water by dessication.

The analyses which I have made of a great number of salts formed by these bases with the oxacids, clearly show that all the salts contain one atom of water, which is necessary to their composition, and cannot be taken away without their decomposition. Thus these bases exhibit a complete analogy with ammonia in their manner of acting with the acids. They combine directly with the hydracids without decomposition, and form hydrochlorates and not chlorides, as is the case with the mineral oxides; and with the oxacids dissolved in water, the vegetable bases combine, and fix one atom of water which enters intimately into combination with them. It is remarkable that the interesting bases, containing nitrogen, lately discovered by M. Liebig, contain one atom of water in most of the salts which they form with the oxacids. It is probable that their other oxysalts present an analogous composition. Finally, urea, which, from the whole of its properties, cannot be considered otherwise than as an organic base, does not make an exception to this general mode of composition, as I have perceived in the analyses of the oxalate and nitrate of urea, which, until the present time, have been considered anhydrous.

We are thus led to divide the substances which act the part of bases into two very distinct groups.

In the first group are comprised those substances which cannot combine with the hydracids without decomposition; which, for example, form with hydrochloric acid, chlorides,

and of which the salts formed by the oxacids can be readily obtained anhydrous by dessication. These are all mineral bases.

The second group comprise those bases which combine directly, without decomposition with the hydracids, and form hydrochlorates and not chlorides, and which form salts with the oxacids only when water is present. These salts always retain one atom of water, from which they cannot be separated without decomposition. This group contains all the bases of the organic kingdom, as yet known.

Ann. de Chim.

ART. XXXII.—THE FREQUENT ADULTERATION OF DRUGS;
CALOMEL, EXTRACTS, BELLADONNA. By T. & H. SMITH,
of Edinburg.

We are happy to observe that the attention of the profession is beginning to be directed to the disgraceful adulterations to which medicines are subjected. We hope it will have the effect of rousing our brethren from the state of lethargy into which they have been so long plunged, and induce them to take the honorable position of zealous cultivators of science, in place of the more degrading one of mere shopkeepers and traders. The profession certainly owe a debt of gratitude to Dr. Thomson for the facts brought forward in his evidence before the Committee of the House of Commons; and to you, also, for laying them before the medical profession. Very important facts may also be found regarding the adulterations which are carried on in the drug trade in a very able appendix, by Professor Christison, to a Report by the College of Physicians of Edinburg, on this subject. The disclosures which will, no doubt, be elicited on this subject, however painful and annoying to individuals, must do good; no evil can be remedied until it is fully known, and it will,

therefore, be necessary, as sometimes happens in surgical cases, to use the probe, even although it should touch the quick.

Dr. Thomson, in his evidence, states that sulphate of baryta is a common adulteration of calomel, but we lately discovered a deterioration of a much more serious nature in that important remedy. A quantity of that drug, got from a wholesale London house, indicated very distinctly the presence of corrosive sublimate; we therefore washed it completely, and on drying it carefully we found that the six ounces of perfectly dry calomel which we used, had lost exactly one drachm; the solution answered to all the tests for the bichloride; we then revived the mercury, with a solution of the protochloride of tin, but from an accident that unfortunately occurred to the vessel in which the process was conducted before we could get the mercury weighed, we could not ascertain the exact quantity. Now, allowing that there was a drachm, and there could not be much less, from the quantity of metallic mercury recovered, we would have one grain of corrosive sublimate in every forty-eight of the impure calomel; a quantity, we should conceive, very likely to produce serious consequences in certain cases, when large or frequently repeated doses are given; or, at all events, very much to obscure the results of treatment. Although this deterioration cannot have been designed, the result is equally serious, and must have arisen either from the grossest ignorance, or the most culpable carelessness, and shows the necessity of allowing no one to enter into any department of the drug trade without the most searching examination of his knowledge of pharmacy, both practical and theoretical.

The evidence of Dr. Thomson regarding the inferiority of the extracts supplied to the profession is fully confirmed by the facts that have come to our knowledge. Is it not amazing, that notwithstanding the admitted superiority of the extracts prepared according to Barry's method, and which has now been so long known to the profession, it has hitherto been almost impossible to procure them, but that the ordinary

trashy, and frequently worse than useless extracts, are in regular use. With this view of the subject we recently got a vacuum apparatus fitted up, and in the preparation of extracts with it, we ascertained that the inferiority of the ordinary extracts must arise from something in addition to that arising from the way in which they are usually prepared; probably in some way equally ingenious with that of the drug-grinder mentioned in Dr. Thomson's evidence, who, out of two chests of Peruvian bark, manufactured twenty. After thoroughly exhausting a quantity of Indian rhubarb with water, we obtained $4\frac{1}{2}$ ounces of extract from every pound of the root, after due evaporation of the liquid. The price charged for the extract, according to the wholesale London price list, is 10s. per pound; the root itself is 5s. 9d. per pound: now, it is evident that if a genuine root is used for the preparation, it ought to be 20s. per pound, without allowing a single penny for profit or expense incurred in making it. From 15 ounces Peruvian bark we obtained $1\frac{1}{2}$ ounces of extract; however, we may say $2\frac{1}{2}$ ounces, as by our method there is about an ounce of inert resinous matter separated in the course of preparation, leaving a perfectly transparent extract. The present price charged for the extract is, at a maximum, 14s. per pound; the bark was 3s. per pound some time since; now, at such a price, without allowing anything for the trouble of preparing it, the extract should be 19s. per. pound; but as there has been a considerable rise in the price of bark, the difference must be much more striking; we will make no comment, as the facts speak for themselves.

Another circumstance came to our knowledge which shows strikingly the evils that may arise from ignorant individuals getting into the drug trade. We employed an herb collector to procure us some belladonna for the preparation of the extract, for which she brought us a quantity of *Solanum dulcamarum*, instead of the belladonna; on informing her* that she had not brought the proper plant, she expressed

* Women are in the habit of collecting medical plants for the druggists in Scotland.

her surprise, as she had been in the habit of supplying a wholesale drug house with large quantities to be put to the same use. We will not take up your valuable space with any further remarks, but remain your obedient servants.

Letter to Editor of Lancet.

ART. XXXIII.—EXPERIMENTS WITH THE WOURALI POISON. Performed by Mr. WATERTON, at the Medical School, Nottingham.

Extracted from a Letter of W. R. Clanny, to the Editor of the Lancet.

For the *first experiment* a large dog was chosen. To prove the certainty of the action of the poison to destroy life, an incision was made in the side of the dog, and a spear-head, covered with the poison, inserted into the wound; this was left in the side, in order that the poison might be absorbed into the system. In about a quarter of an hour the circulatory system was much increased, the pulse rising to 130 in the minute, and the action of the heart being irregular; the creature was unable to stand at 36 minutes after the insertion of the poison; convulsive twitchings of the whole body were evident, and the pulse continued irregular up to the time of its death; at 52 minutes it ceased to breathe, but the heart continued its action; in a few minutes after the chest was opened, and the heart irritated with the end of a scalpel, but in a short time the irritability ceased.

The *second experiment* was then entered upon, and an ass was chosen for it. It was intended, in this experiment, to use *artificial respiration* during the whole of the time that the animal continued under the influence of the poison, so that when its power had ceased, the creature would resume its natural respiration, and the artificial means be discontinued, thus enabling it to survive the powerful effect of this most deadly poison. The arrow-head, covered with the poison,

was inserted into the lower part of the neck of the ass, a few minutes after nine; in about a quarter of an hour the heart began to beat irregularly; the respirations were about 15 in the minute; the pulse was accelerated, and the pupils of the eyes were dilated; in half an hour the breathing became difficult and irregular, and the pulse had risen to 104; at this moment the creature fell, as if dead, perfectly motionless, and the pulse could not be felt. An opening was immediately made into the wind-pipe, and the apparatus, which had been prepared for the purpose of carrying on artificial respiration, was applied, and put in action; this consisted of a tube, which was introduced into the opening of the wind-pipe, and a pair of bellows, which were attached to this tube; the lungs were then inflated, and afterwards emptied by pressure on the body; this action being kept on regularly and steadily, supplied the place of the natural respiration; this process was persevered in for *seven hours and a half*, at which time the animal commenced breathing by its own efforts. During this time but little change occurred in the animal; it lay motionless, and apparently lifeless; its extremities were to a certain extent cold, the respiration had ceased, and the heart beat very feebly. From the time of animation returning the animal has been gradually improving, and had eaten plentifully of hay, &c., but a degree of paralysis of the limbs exists, from the application of *strychnine*, which was used with the view of restoring it earlier from its state of temporary death, by inducing a degree of spasm. In the course of the night the tube was removed from the wind-pipe, and a quantity of mucus escaped from the wound, followed by a little coagulated blood; the wound was then closed, and respiration went on by the natural openings.

The *third experiment* was commenced on Tuesday morning. The ass chosen was younger and in better condition than the previous one. The poison was inserted in a similar manner, but only a fourth part of the quantity was used; the ass for some time suffered but little, and continued to eat hay.

The effect was evident in 34 minutes (four minutes more than in the previous experiment,) when the animal fell, senseless and motionless; artificial respiration was carried on for two hours, at which time natural respiration commenced; the ass was so far recovered at the end of six hours as to get up and stand by itself. This experiment may then be looked upon as more satisfactory than the previous one, and it shows how very much sooner the animal may be restored after having a smaller dose of the poison administered, and that its effect is much more transitory.

The advantage derived from these experiments on the lower animals, is the hope that this agent may be applied, and prove to be successful, in the cure of hydrophobia, a malady which, up to the present time, has defied all treatment; if it is brought to bear, its action appears to be to suspend animation, and so far exhaust the powers of the body as to turn out, or destroy the hydrophobic poison.

During the afternoon of Monday, to prove the virulence of the Wourali poison to a medical gentleman who had been prevented from witnessing the experiments, Mr. Waterton inserted a dart near the shoulder of a small spaniel; in about seven minutes and a half the poison began to take effect, and in nine minutes pulsation ceased.

Between the hours of four and five on Tuesday afternoon the second ass was so much recovered as to be able to carry Mr. Waterton round the room.

Since my discovery of the gases circulating in our arterial and venal blood, we have been enabled to explain the phenomena of the action of the Wourali poison in such cases.

We find that, in the first experiment, artificial respiration was not employed, and that the deleterious effects of the poison were allowed to take their course upon the sensorium commune; hence the absorption of atmospherical air into the extreme branches of the pulmonary veins was prevented.

In the second experiment, the animal's life was saved by

artificial respiration, and thus a certain portion of atmospheric air was absorbed into the systemic system.

The third corroborates the previous experiments, and requires no comment.

From the above-named discovery, made in the year 1834, we can also readily understand the manner in which the fœtus in utero receives a suitable quantity of oxygen from the parent. Time presses and I must conclude.

ART. XXXIV.—ON A NEW COMPOUND, CONSISTING OF IODIDE OF POTASSIUM, IODINE, AND THE ESSENTIAL OIL OF CINNAMON. By JAMES APJOHN, M. D., M. R. I. A., Professor of Chemistry in the Royal College of Surgeons, Ireland.

THE compound which is the subject of the present communication, owes its origin to an unchemical medical prescription. A solution of iodine and iodide of potassium in cinnamon water, having been directed by a physician of this city, in the winter of 1837, his patient found that during the prevalence of very cold weather, the solution, which had been previously turbid, became quite clear, and nearly insipid, and, upon examining the bottle closely, he observed, deposited in the bottom, a small quantity of minute capillary crystals. These crystals were brought to Mr. Moore, of Anne street, the apothecary in whose establishment the prescription was made up, and by him to me for chemical examination and analysis. Before detailing the means which I have employed for determining the exact constitution of this substance, it will be proper to give the process by which it is best procured, and enumerate its leading properties; points, both of which were investigated by Mr. Moore and myself conjointly.

To a gallon of cinnamon water,* first reduced nearly to 32° , add four ounces of iodide of potassium and forty grains of iodine, previously dissolved in a minimum of cold water. Upon the instant of admixture the solution becomes quite turbid, owing to the production of a yellowish sediment, and this, in less than a minute, becomes crystalline, and then gradually subsides. The supernatant solution, which appears almost entirely deprived of iodine and oil of cinnamon, is now drawn off with a siphon, and the crystals and residual fluid thrown upon a single filter, which, when sufficiently drained, is enveloped in several folds of blotting paper, and transferred to a chalkstone, where, by the absorbent powers of the latter, and the occurrence of spontaneous evaporation, the product is rendered perfectly dry and pure. With the quantities stated, above 60 grains of the compound are obtained. A temperature at, or very close to 32° , is necessary to the success of this process. At 40° the brown powder, already noticed, is alone produced, and in much diminished quantity. This brown sediment, however, is identical with the crystalline product, for it may be converted into crystals simply by reduction of temperature, and I have even found it to undergo the same change when collected on a single filter, and set to dry on a bibulous stone at the temperature of 45° .

The crystals are capillary, quadrilateral prisms, without pyramidal terminations. They are of a beautiful brown or bronze color, and have a strong metallic lustre. Their taste is extremely hot and pungent, resembling closely that of oil of cassia, but partaking also of that of iodine. In alcohol and ether they are readily dissolved, and from these solvents they are again deposited with their original appearance upon the occurrence of spontaneous evaporation. They are decomposed by water, which extracts from them iodide of potassium, and causes the separation of oily drops of a dark color, which are either a mechanical mixture or a peculiar compound of iodine and the oil of cinnamon. The action of water, how-

* This water should be prepared by introducing into a still one pound of cassia bark, and two gallons of water, and drawing off one gallon.

ever, is greatly diminished when it is close to the freezing point, and appears altogether prevented when a certain amount of iodide of potassium is present.

When heated to 82° , the crystals melt into a dark liquid, from which, upon cooling, the original substance is reproduced. When heated beyond its melting point, iodine, and a vapor smelling strongly of oil of cinnamon sublime, and iodide of potassium is left behind, mixed usually with a little carbon, resulting from the decomposition of a portion of the oil. Starch would appear to decompose this substance, for with even its alcoholic or ethereal solution it forms the well-known blue compound. When agitated with water and zinc, or iron filings, an iodide of these metals is produced, and the oil is set free. With mercury the result is the same, and in each instance for water, alcohol or ether may be substituted. Potash, also, at once develops the oil, forming, as is the case of free iodine, iodide of potassium and iodate of potash.

From these facts it seems legitimate to infer that it is the oil, and not any modification of it corresponding to the benzoyle of chemists, which is associated with the iodine and iodide of potassium, and that they are all held together by an extremely feeble affinity, inasmuch as not only is the iodide of potassium separated by water, as has been stated, but the iodine is affected by a solution of potash, just as if it were free. To test the truth of this opinion, a little of the compound was decomposed in a small glass retort by the exact equivalent of a very dilute caustic alkali, and, a receiver being applied, about half an ounce of a liquid, having the appearance and obvious properties of cinnamon water, was drawn off by distillation. From it, however, I could not, though every precaution was employed, procure a particle of the original crystalline compound. The properties, indeed, of the distilled liquid were not, upon an accurate examination, identical with those of cinnamon water. Its odor, for example, was slightly different, and it reddened litmus, a circumstance from which it may be inferred to contain cinnamic acid. It is therefore not unlikely that the oil may have absorbed oxygen, or have

been otherwise altered during the distillation; and as a confirmation of this opinion I may mention that the oil of cassia, which is found in the market, is chiefly cinnamic acid, and that a cinnamon water prepared from it by a process directed in some of the Pharmacopœiæ, yields but a very minute proportion of the substance which is the subject of the present paper.

With a view to the analysis of this compound, the first point to determine was the proportion of iodide of potassium which it included. To accomplish this, a known weight of it was heated in a small porcelain capsule, by which iodine and oil of cinnamon were expelled in the vaporous state, and there remained a mixture of iodide of potassium with a little carbon, resulting from the decomposition of a portion of the oil. The iodide of potassium was separated from the carbon by solution in water, and the use of a single filter which had been previously deprived of all soluble matter by the action, first, of a dilute acid, and subsequently of distilled water. The filter being well washed, the solution was evaporated to dryness in a carefully counterpoised capsule, and then accurately weighed. The following are the results of three experiments thus conducted:

	I K	I K (per cent.)
3.37 grains gave .	0.43	12.75
8.00 . . .	1.03	12.87
9.40 . . .	1.13	12.02

The mean, therefore, of the numbers in the third column, or 12.55,* is the quantity of iodide of potassium as obtained by me in 100 grains of the compound.

The next step was to investigate the iodine associated, not with the potassium, but with the oil, and, to effect this, the following was the course first pursued:

A known weight of the compound was decomposed by a slight excess of an alcoholic solution of potash, and the whole

* This contains 9.58 grains of iodine.

was evaporated to dryness, by which the oil was partly volatilized and partly decomposed. Heat was now cautiously applied, so as to reduce the iodate, which I have already stated to be always formed in such experiment, to the state of iodide of potassium, but not to volatilize any of the latter salt. The residue, first permitted to cool, was treated with distilled water, and passed through a filter to separate the carbon. The filter was well washed, and the solution, having been reduced to a small bulk by evaporation, was precipitated by nitrate of silver, and the iodide of silver, firstedulcorated three or four times with cold distilled water containing a few drops of ammonia, was finally dried, melted, and weighed.

In an experiment, in which 10.33 grains of the compound were employed, the iodide of silver amounted to 7.41 grains, equivalent to 3.95 of iodine, or 38.24 for 100 grains of the compound. Now, if from this we subtract 9.58, the iodine in the 12.55 grains of iodide of potassium which we have already found to exist in 100 of the compound, we shall get for the per centage of iodine, in union with the oil, the number 28.66.

Fearing that the heat applied in reducing the iodate of potash to iodide of potassium, might have either been insufficient for the purpose, or have volatilized some of the latter salt, I recommenced the estimation of the amount of free iodine, or rather of that united to the oil, by a somewhat different process.

A known weight of the substance was introduced into a test tube with water and zinc filing, and the other end being drawn out at the spirit lamp, it was hermetically sealed, so as effectually to prevent the volatilization of iodine. Agitation was now resorted to, and a gentle heat at the same time applied, which caused the separation of the oil, the iodine previously combined with it having entered into union with the zinc, and formed with it a salt dissolved by the water. The tube was now broken, and its contents having been thrown upon a single filter, previously deprived of all soluble matter,

distilled water was poured on until the entire quantity of the iodide of zinc was carried through. The washings were concentrated, suffered to cool, and then treated with the equivalent quantity of nitrate of silver, and the resulting precipitate (iodide of silver) having been, as in the previous experiment, sparingly washed with cold water, containing a little ammonia, was dried and weighed. From this the total quantity of iodine in the compound, both that combined with the potassium and with the oil was collected. But the quantity in the former state having been already ascertained, the difference is the quantity of iodine associated with the oil.

In an experiment thus conducted, 6.55 grains of the substance yielded, of iodide of silver, 4.52 grains, equivalent to 37.20 grains of iodine for 100 of the compound. Subtracting from this 9.58, the iodine of the iodide of potassium, we obtain, as the representative of the amount of this element asso-

ciated with the oil, the number 27.62. Hence $\frac{28.66 + 27.62}{2}$

=28.14, is the mean amount of the iodine in the latter state of combination, as derivable from both experiments. But

$\frac{28.14}{9.58} = 2.93$, or $9.6 = 3$. We thus arrive at the conclusion

that for every atom of iodide of potassium in the substance under consideration, there are three atoms of iodine in combination with the oil of cinnamon.

Before leaving this branch of the analysis, I may observe that the iodine of the oil may be directly obtained by decomposing the compound in a glass tube, at a red heat, in contact with lime, and acting upon the residue with water, which dissolves the iodide of calcium, and along with it a little lime. The latter being separated in the usual manner by carbonic acid and boiling, the former may be precipitated by oxalate of ammonia, and the iodine estimated from the amount of carbonate of lime afforded by the oxalate when calcined at an obscure red heat.

The experiment made upon this plan did not give a very satisfactory result; and, when I considered the great dispro-

portion between the atomic weights of iodine and of lime, I did not feel disposed to repeat the process.

The iodine may also be taken out of the compound by filings of iron, as well as those of zinc, in the form of iodide of the metal; and, though the theoretical objection just stated to the process by lime, is equally applicable to this method, a single experiment, whose particulars I subjoin, thus conducted, led to a conclusion corresponding very closely with that already obtained.

Eight grains of the compound gave 0.72 of peroxide of iron. But this amount of peroxide corresponds to 2.27 of iodine. Hence

$$8 : 2.27 :: 100 : 28.41 \text{ — the}$$

percentage of iodine associated with the oil, and which exceeds the result, 28.14, obtained by the other methods by a quantity so small, that it may be viewed as affording a corroboration of the correctness of the previous determination.

Having determined the iodide of potassium and the iodine in union with the oil, we can now state the composition of the compound, assuming the residue to be oil of cinnamon.

Iodide of potassium,	.	.	12.55
Iodine,	.	.	28.14
Oil of cinnamon,	.	.	59.30
<hr/>			
			99.99

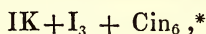
That it is the oil itself, and no oxidized or other modification of it, which exists in this compound, I have already assigned reasons for believing; and as, by the application of such heat as will fuse the compound, no water is set free, it becomes highly probable that the statement above made is a correct representation of its constitution. But the oil of cinnamon has been analysed, and through the researches of Dumas we are acquainted with its real composition, which he has shown to be represented by the formula $C_{18}H_8O_2$. If then the view, numerically expressed above, be the true one,

the 59.30 parts of oil must correspond to some integer, or at least simple number of atoms. And, reciprocally, if we find such to be the case, we shall be fortified in the conclusion which we have drawn.

With a view to this method of verification, let the numbers which represent the iodide of potassium and iodine, and that which is supposed to represent the oil, be divided by their respective atomic weights, and let the quotients be reduced to others in the same ratio, and so that the iodide of potassium may be represented by unity. When these arithmetical operations are performed, we obtain the numbers in the second and third columns of the following table, the former being the quotients themselves, and the latter other numbers bearing to each other the same proportion.

	(1.)	(2.)	(3.)
Iodide of potassium, .	12.55	0.075	1.000
Iodine,	28.14	0.223	2.973
Oil of cinnamon, .	59.30	0.442	5.893

The numbers, it will be seen, in the last column approximate so closely to the integers 1, 3, and 6, as to leave little doubt that the true empirical formula is



a conclusion which is strikingly confirmed by the following statement of the composition of our substance in 100 parts calculated upon this hypothesis:

Iodide of potassium, . . .	12.26
Iodine,	28.08
Oil of cinnamon, . . .	59.66
	<hr/>
	100.00

To apply, however, to this conclusion, the most decisive test, it remained to burn the substance with oxide of copper,

* Cin is assumed as the symbol for the oil of cinnamon.

and see whether the carbonic acid and water thus obtained would correspond with the amount of oil of cinnamon ascribed to the compound.

7.08 grains, Liebig's apparatus for potash being employed, yielded, of carbonic acid, 12.70 grains, and of water 2.60, equivalent to 3.513 carbon, and 0.288 hydrogen. But, adopting for a moment the empirical formula already arrived at, the 7.08 grains of the substance would contain 4.223 of oil of cinnamon. If, therefore, from this we deduct the carbon and hydrogen, we obtain the oxygen, and find the constituents of the oil as follows:

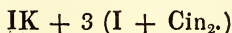
Carbon,	.	.	.	.	3.513
Hydrogen,	.	.	.	.	0.288
Oxygen,	.	.	.	.	0.420

If these be divided by the atomic weights, and if, also, we substitute for the quotients numbers in the same ratio with them, that for carbon being assumed 18, we obtain the following:

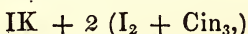
Carbon,	.	.	.	.	18.00
Hydrogen,	.	.	.	.	8.82
Oxygen,	.	.	.	.	1.60

As the conjoint result, therefore, of our analysis and our hypothesis, we find the formula for oil of cinnamon to be $C_{18}H_{8.82}O_{1.60}$. Now this is so close to the formula of Dumas, viz.: $C_{18}H_8O_2$, particularly when we consider that owing to the fusibility of the compound, and the facility with which it is decomposed, heat could not be applied in drying the contents of the tube before the commencement of the combustion, and that consequently the hydrogen must have been too high and the oxygen too low,—considering this, I say, the accordance is so close as to leave no doubt that the empirical formula already given, correctly represents the constitution of the compound submitted to analysis. It is scarcely necessary

to say that the most probable rational formula is that here subjoined:



From the analysis which I first performed, and of which I gave a brief account in the Chemical Section at the Liverpool Meeting of the British Association for the Advancement of Science, the formula deduced was



which differs from the preceding merely in containing one more atom of iodine.

This compound appears interesting under many points of view. In the first place, it is one of considerable complexity, is decomposed with an extreme facility, and is nevertheless perfectly definite in its composition, and even beautifully crystallized.

In the second place, it is a kind of double salt, composed of two haloid salts, in one of which the oil performs the very unusual function of an electro-positive or basic metal,—a circumstance the more singular, as Dumas has shown that it unites also to the muriatic and nitric acids, forming with them binary compounds, the latter of which very readily crystallizes. The oil, in fact, thus appears to act the part of a metal as well as of an oxide.

Lastly, I may observe that the method by which our compound was first accidentally formed, and is still best made, presents an instance of incompatibility which had not been previously suspected, and will, no doubt, suggest to chemists experiments which will eventuate in the production of a series of similar substances. In reference, however, to this latter point, I should add that Mr. Moore has applied to the other aromatic waters the very process which succeeds with cinnamon water, but without obtaining a trace of any new product. It is possible, however, that new results might be obtained by substituting other metals for the potassium, and replacing

the iodine by bromine, or even chlorine; and I have, indeed, myself commenced some experiments, with a view to this research.

Lond. and Edin. Phil. Mag., and Journ. of Sci.

ART. XXXV.—ORIGIN OF THE ERGOT OF RYE.

By EDWIN J. QUEKETT.

In the *Lancet*, of the 22d of June, is a paper, signed "F. B.," in which it is asserted that I have assumed to myself the credit of discovering ergot, which credit, it is said, is due to my friend, Mr. Smith, of the Royal Botanic Gardens, Kew. I shall, therefore, feel obliged by your insertion of the following; though I do not consider myself bound to answer anonymous correspondents, yet, as I am represented to have acted unhandsomely towards an individual for whom I have always entertained the greatest respect, both for his talents as a botanist, and his personal kindness to me, (which feeling of respect appears mutual, if I may judge from his last letter to me, dated June 3d, 1839,) therefore I cannot consent to remain silent.

It appears somewhat strange that "F. B." should have allowed Mr. Smith's claims to slumber for eight months, more especially as during this time I have often met Mr. Smith, who has never once opened his lips to me on the subject.

To explain the matter, I must state, that when at Kew Gardens, in the summer of 1838, Mr. Smith pointed out to me the "*elymus sabulosus*," a grass, as being ergotised; and as I, as well as he, doubted the opinions hitherto entertained of its nature, I was glad to have the opportunity of examining it in the recent state, and begged a few spikes of the grass (not "the fluid" only, as F. B. mentions,) which I told Mr. Smith were for the purpose of investigating the matter. The

specimens were kindly given me, and Mr. Smith did not say he was, or had been working, at the subject, more than watching the grass externally, and he told me that he conceived the liquid on the spike (the "certain fluid" of F. B.) to be deposited or produced by a peculiar fly that was often seen on the grass, and which fly he imagined to be more or less connected with the formation of the ergot, as the cynips is with the nut-gall.

About a week after, having examined, by the aid of the microscope, the specimens I myself brought from Kew, I wrote for more, and mentioned that "I had discovered the whole secret," as I then thought, for I had found the fluid to consist of sporules, which could not be any excrementitious fluid of a fly; which sporules, sporidia, or jointed bodies, were, I conceived, the reproductive particles of a fungus,—of what kind I then had not made out.

In a letter sent me by Mr. Smith, bearing date of October 15, 1838, my request is acknowledged, and he offers to bring me the specimens to my house, which was done, and in the same note he mentions that he had not seen the fly lately, but had collected the fluid, and found sporules also, in which he meant to steep grains, for the purpose of making them produce ergots when they grew to perfection. When Mr. Smith was with me, I showed him specimens of the ergot under my own microscope, and pointed out that the relation of the ergot to the styles and scales, at the bottom of the flower, was precisely that of the healthy grain, and neither of us at that period knew how to account for the sporules in any way being capable of producing an ergot.

I heard nothing more of Mr. Smith's investigations till we met at the Linnæan Society, on November 6, when a paper was read on the ergot by Mr. Smith, the printed abstract of which F. B. has published in full. After the reading I believe I uttered the words to Mr. Smith, "you are wrong" (which F. B. seems to be acquainted with,) because I did then differ in opinion from some of the points in that paper.

Now the truth must be told, that the abstract of Mr. Smith's

paper, published in the "Proceedings of the Linnæan Society," does not contain all the opinions that gentleman entertained at that time; for, after his description of the fungus, and his discovery of it in the *anthers*, and his opinion that it caused ergot by communicating disease to the grain, he mentioned that these minute joints became *animated*, or, in other words, animalcules, when kept for a short time in the liquid that was obtained from the plant which contained them; which fact is in opposition to his former discovery; for one being cannot belong to two kingdoms, and I expressed my opinion on this and other points; and, as F. B. seems to recollect, I uttered the words "I am sure you are wrong."

In the interval between the meeting of the Linnæan Society, on the 6th of November, and that of the 4th of December, I carried on my examinations into the cause and structure of ergot; and at the meeting of the Society held on the evening of the latter date, I am accused of adopting Mr. Smith's views in the paper that was then read. I confess I did adopt his views of the nature of ergot, but I did so without borrowing his discovery of the fungus on the anthers to convince me; and it was by patient investigation, and experiments of a delicate nature, that I arrived at the conclusions I did, which took three weeks of continued examination to complete, and which substantially proved what I then considered had only previously been partially done.

These observations are recorded in another place, and are not required to be gone through again in the present instances; suffice it to say, that they consisted in proving that the external particles of the ergot were not animalcules, but sporules of a fungus, which I succeeded in causing to germinate, going through all the various states, from the commencement to the perfect state of a plant, up to its development of similar bodies to those from which itself was produced; which series of observations incontestably proved that the fungus was a separate plant from the grain, and I considered I had as much right to make known my discovery of the independent germination of the

sporules, as a proof of the nature and origin of ergot, as what Mr. Smith had by his finding the fungus on the anthers.

I am accused by this anonymous writer of not giving Mr. Smith his share of the credit of the discovery of the origin of ergot, either in my paper or in the abstract; but the fact is, Mr. Smith's paper had been read and spoke for itself; and in the "Proceedings" both papers appeared as abstracts; and if I did not put forth what that gentleman discovered, I mentioned the essential matter of his observations. But I feel that some apology is due to him for leaving his name out of my account of the ergot, inserted in the "Medical Gazette" of the 19th of January, which was done inadvertently from a desire of brevity, and not with a view of wishing to take from him any share of credit to which he is entitled for his observations.

According to F. B. the credit which he wishes to claim for Mr. Smith is the discovery "that the ergot is not a fungus, but a diseased grain, occasioned by the growth of a fungus, not previously detected." But it is fair to other botanists, who have examined the nature of ergot, to state their discoveries and opinions before this claim is adjudged to any individual in particular.

And if F. B. reads Fries's description of *Spermoëdia* he will find that he considered it the diseased grain of grasses; and in a note in the "English Flora," (Vol. v., Part ii., p. 226,) Berkeley entertains the same idea. If F. B. reads Phœbus's account in the "Deutschlands Kryptogamische Giftegewächse," 1838, he will find the ergot figured as a diseased grain correctly, and also the sporules of the fungus of F. B., "not previously detected," are there also figured with extreme accuracy; and it is also there stated, as well as in Christison's "Treatise on Poisons," (3d edition,) that Wiggers could produce ergot by infecting healthy grains with the seeds (sporidia) of the fungus; and in Philippar's "Treatise on the Nature and Origin of Ergot" the *viscid juice* is described, its supposed origin is pointed out, and its containing numerous sporules is also related; he goes farther, and figures the sporules, and gives a drawing of the fungus on the *anthers* cementing them together into one

mass, and occasionally calls the ergot an "ergotized grain;" but still in these several descriptions all but the discovery is made out, and some credit is to be given to these individuals for their observations, which I myself, and I believe Mr. Smith, likewise, were ignorant of whilst investigating the subject.

To Mr. Smith, I will say, is due that share of the discovery in which he proved and described what Berkeley and others previously imagined, viz.: that the body known as ergot was not a fungus, but a diseased grain, and I reserve for myself the substantiating of his views by a different and more perfect proceeding; and also as being the first to observe the parasitic fungus to develop throughout all its stages up to maturity, and to arrive at a perfect plant, unconnected with any part of a grass; which fungus being new and undescribed, I considered I had the privilege of naming *Ergotætia*, and did think of taking the specific name of it after Mr. Smith, as "F. B." mentions, on account of my respect for him, and also because he was the first that I was then aware of to detect it in a place where it was not before observed, which fact went a considerable way towards pointing out the true origin of ergot; but by the advice and suggestion of a mutual friend, Mr. N. B. Ward, of Wellclose square, I adopted the term *abortans*, for reasons which "F. B." has assigned; and had I any doubt of Mr. Smith's share of the discovery, is it probable that I ever should have proposed his name as being fitted to form the specific one of the newly discovered genus?

I trust, from what has been said, that I have acted in no way to deprive Mr. Smith of his claims; and, in fact, here I allow them; and if I did not speak of them so fully as he wished, I did not deny them, or speak in any way against his discovery in my paper.

There is one more point that I must take notice of:—F. B. remarks, that I "may, by subsequent observation and research, have developed some minutiae which do not appear in the paper of Mr. Smith, is what might be expected, and need not be denied." Now great care is taken to withhold the nature

of these minutiae, and, in fact, these minutiae are all that I do claim, being the development of the fungus, apart from the plant, and proving that the bodies in the interior, which had been supposed to be sporules of the fungus, are nothing but fatty particles, incapable of producing ergot, being, in fact, the most substantial of the proofs that the ergot is a diseased grain, and not a fungus, containing sporules, as Philippar, and previous investigators, had imagined.

I am sorry to be obliged to make this public reply to accusations brought against me by an anonymous correspondent, but I trust that nothing I may have said will prove offensive to Mr. Smith ; and I beg to assure that gentleman (for whom I, as well as many others, have always entertained the greatest respect,) that nothing do I here state with the view of depreciating his abilities, or wishing to detract anything from his merits : and I do hope that Mr. Smith and F. B. will feel satisfied with this explanation. At the same time I must remark, that should a further correspondence be entered into, I shall not take notice of any more *anonymous* communications, and have to express my regret that I have taken up so much of your valuable pages in refuting accusations brought against me.

Letter to Editor of Lancet.

ART. XXXVI.—ON NARCOTINE AS A SUBSTITUTE FOR QUININE IN INTERMITTENT FEVER. By DR. O'SHAUGHNESSY.

ON the 4th of August, 1838, at the meeting of the Medical Society of Calcutta, Dr. O'Shaughnessy laid before the Society the details of thirty-two cases of remittent and intermittent fevers treated by narcotine as a substitute for quinine, and of which thirty-one were cured. The cases previously described in the First Report of the Pharmacopœia Committee were twenty-seven, making on the whole sixty, of which the narcotine was successful in all but two.

The cases now communicated were as follows :—

Two cases by Dr. Goodeve; one of them the case of the late deputy-collector of Chittagong. Quotidian of several months' standing; spleen enlarged. Quinine was used without success, although given in every possible form. Arsenic was then tried and checked the fever, but did much mischief to the patient's general health. Narcotine was then employed, and with such success, that Dr. Goodeve concludes thus:—"I do not hesitate in saying that this patient owes his life to the remedy in question." The other case was a patient laboring under inflammation of the bowels at the same time, where the administration of quinine would have been inadmissible.

Three cases are reported by Dr. Smith, of Hidgelee, who adds, "As far as these three cases go, I cannot speak too favorably of narcotine, and am very desirous of trying it more extensively." Captain Marshall, of Calcutta, communicated three cases of severe ague occurring among his servants; all were rapidly cured; and Captain Marshall says, "It would be presumptuous in me to offer any opinion as to the virtues of narcotine; all I can say is, that if ever I am ill of fever I shall unhesitatingly and confidently prefer it to sulphate of quinine, or any other medicine I know of."

Mr. R. O'Shaughnessy described the case of a man on whom he had operated for stone, and who was attacked by

violent ague on the day of the operation. The ague returned next day at the same hour. Mr. O'Shaughnessy considered it unsafe to employ quinine under these circumstances, and had recourse to narcotine. Four doses of this medicine were given, and Mr. O'Shaughnessy states, "The fever did not return; the wound was not in the slightest degree affected; there was no excitement or headach produced. After he took the first dose he slept soundly, which he had not done the two previous nights, and he was discharged cured of the effects of the operation on the fourteenth day after its performance."

Mr. O'Brien, the apothecary of the Native Hospital, reported three cases; Mr. Evans one; the Pundit Modoosoodona Gupta one, all successfully treated. The Pundit's patient labored under dysentery at the same time.

Dr. J. Chapman, assistant-surgeon of the Calcutta General Hospital, related the case of a European who contracted violent remittent fever at Kedgerree, on the 16th of July, and was received in hospital on the 19th. Quinine was used in the usual manner on the first remission on the 20th, and again on the 21st, but the symptoms were rather aggravated than improved. The narcotine was then given, and its use was speedily followed by a complete remission. From that time the fever did not return, with the exception of restlessness and slight headach on the evening of the 23d. On the 28th all medicines were omitted, and the patient was discharged convalescent.

Dr. O'Shaughnessy further submitted two cases, treated in his own house among his servants, both of which were cured. Lastly, he communicated fifteen cases, extracted from the journals of the Medical College Hospital. In five of these cases quinine and arsenic had failed, in eleven there was enlargement of the spleen or liver, in one inflammation of the knee-joint. Seven of these cases were remittents, and two of these had died. Of the two fatal cases one was admitted on the seventh day of violent fever and died next day. In the second (a child) the spleen, liver, pancreas, and mesenteric

gland were immensely enlarged, and the case hopeless from the beginning.

Dr. O'Shaughnessy added that, besides the sixty cases now recorded, more than one hundred ague patients had been treated by his pupils and acquaintance with perfect success by this remedy.

[In a subsequent number of the "India Journal" the following letter appears, addressed to Dr. O'Shaughnessy, by Mr. Green, civil surgeon, Howrah:—

"I have now employed the narcotine in sixteen cases of remittent fever, and such is my opinion of the efficacy of the remedy, that in instances of fever, intermittents and remittents, in ordinary healthy subjects, and in whom there is no complication of severe organic disease, I give it with the full expectation of arresting the next periodic return of the fever. I have seen this result follow in ten of the cases of the fever alluded to. I consider narcotine a more powerful antiperiodic than quinine. The remedy does not act silently. I have observed a degree of general heat follow its use in the first instance, and, subsequently, perspiration; so that it appears to excite in the system a salutary and powerful counteraction as to stop the morbid concentration that issues in fever. I have not observed narcotine to lead to local organic disturbance in the cases in which I have used it. In short, even from my scanty experience, I consider the remedy an invaluable one."

Indian Journal of Medical Science.

ART. XXXVII.—ON CINCHONA. Extracted from the Lectures of
JOHN PEREIRA, Esq., F. L. S.

Published in the London Medical Gazette.

THE family *Rubiaceæ* of Jussieu, Decandolle, and others, has, by Mr. Lindley, been divided into two families, termed *Stellatæ* or *Stellaceæ*, and *Cinchonaceæ*. *Stellatæ* are distinguished from *Cinchonaceæ* by their angular stems and whorled leaves, destitute of stipules. Moreover they are natives of the colder, while *Cinchonaceæ* belong to the hotter parts of the world.

CINCHONACEÆ.

Characters.—The plants of this family are trees, shrubs, or herbs: their leaves are simple, entire, and opposite, with interpetiolar stipules. The inflorescence varies, but is usually a panicle or corymb. The calyx is monosepalous, superior, and either entire or divided. The corolla is monopetalous, superior, tubular, and divided; its modifications of æstivation being various. The stamina are usually five in number, and arise from the corolla, with the segments of which they alternate. The ovarium adheres to the calyx, has two or more cells, and is of the kind called inferior: it supports a single style, with a simple or divided stigma. The fruit is inferior; the seeds are albuminous.

Cinchona.

Characters.—This genus is characterized as follows:—The corolla is superior, five-toothed, and persistent. The corolla is infundibuliform, or salver-shaped, with a five-parted spreading limb, and valvate æstivation; the stamina are five in number, and are inclosed in the tube of the corolla; the ovarium is inferior; the stigma bifid. The fruit is a many-seeded capsule, with a septicidal dehiscence. The seeds are flat, or peltate, with a membranous laciniate margin.

According to Decandolle, no less than eight genera (including forty six species) have been confounded under the name of Cinchona: they are, Cinchona properly so called, Buena (called by some botanists Cosmibuena,) Remijia, Exostema, Pinkneya, Hymenodyction, Luculia, and Danaïs. The same authority also states that the first of these genera (Cinchona properly so called) is distinguished from the others by the following characters:—1st. The stamina are entirely concealed within the tube of the corolla, and never project beyond it. 2dly. The fruit consists of two cocci, or carpella, which adhere to the calyx; it has a septicial dehiscence from below upwards. 3dly. The seeds are erect, and imbricated on each other, from below upwards. 4thly. The limb of the calyx is toothed only to a third or half of its length, and is persistent at the summit of the capsule. Mr. David Don has also pointed out another character by which some of the genera may be distinguished—namely the form of æstivation. Thus, in the genera Cinchona and Pinkneya, the æstivation is valvate. In Buena, Lasionema (a genus formed by Mr. Don, to include the plant formerly termed Cinchona rosea,) and Luculia, it is imbricated; in Exostema it is induplicate; and in Hymenodyction it is plated.

Species of Cinchona.—In botanical writings great discrepancy exists as to the real number of species of this genus. Thus Humboldt makes eighteen; Poiret twenty-four; Sprengel fifteen; Lambert seventeen; and Decandolle sixteen. This has arisen partly from the confusion of genera, and partly from the difficulty of determining what are real species and what only varieties. Thus the shape of the leaves, which has been used by some botanists for the distinction of species cannot be relied on; and “whoever,” says Humboldt, “determines single specimens of dried collections, and has had no opportunity to examine or observe them in their native forests, will, as is the case with the *Bronzonetta papyrifera*, be led to discover different species by leaves which are of one and the same branch.” Moreover, great uncertainty exists as to the species yielding the Cinchona barks, as I shall show when

speaking of the barks individually. These reasons induce me to omit any notice of individual species.

Geography.—It is a most remarkable circumstance, that hitherto no Cinchonas have been found except in Peru and Colombia. Some writers, indeed, have described plants which they have termed Cinchonas, growing in other parts of the world, but subsequent examination has shown them to belong to other genera. Thus three species of *Remijia*, growing in the Brazils, have been described and figured by M. Aug. de Saint Hilaire, as species of *Cinchona*. The *Cinchona excelsa* of Roxburgh, a tree growing on the coast of Coromandel, is now placed in the genus *Hymenodyction*. The *Cinchona Caroliniana* of Poiret, is in fact a species of *Pinkneya*.

The true Cinchonas extend from 20° south, to 11° north latitude, on the Andes, at varying elevations. It is difficult to assign limits to these elevations, since the statements of Humboldt on this subject are not uniform. Thus the lowest true Cinchonas are variously stated, by himself and Kunth, to grow at an elevation of from 200 toises (1200 feet) to 359 toises (2154 feet;) while the highest are said to grow from 1487 toises (8922 feet) to 1680 toises (10,080 feet.) The temperature of the Cinchona districts necessarily varies with their latitude; perhaps the average is about 68° F.

Method of obtaining Cinchona barks.—"The Indians," says Mr. Stevenson, "discover from the eminences where a cluster of the trees grow in the woods, for they are easily discernible by the rose-colored tinge of their leaves, which appear at distance like bunches of flowers amid the deep-green foliage of other trees. They then hunt for the spot, and, having found it out, cut down all the trees, and take the bark from the branches:" and he adds, "after the Indians have stripped off the bark, they carry it in bundles out of the wood for the purpose of drying it."

This account of the method of procuring these barks is somewhat different from that published many years ago by Mr. Gray, from the papers of the late Mr. Arrot. The latter tells us that the bark is cut from the trees as they stand. Every

two Indians take one tree, from which they cut or slice down the bark with a large knife "as far as they can reach from the ground; they then take sticks about half a yard long each, which they tie to the tree with tough withs at proper distances, like the steps of a ladder, always slicing off the bark as far as they can reach, before they fix a new step, and thus mount to the top, the Indian below gathering what the other cuts." It is afterwards carried in bags to the low country, where it is spread out and carefully dried.

The proper period for cutting the bark is the dry season. Arrot says this is from September to November. Ruiz, however, states that violent rain continues from October to May, when the fine weather commences, and continues to September.

In order to know whether the stems and branches are sufficiently mature for barking, Ruiz says one or two stripes are cut off with a knife, and exposed to the air. If within three or four minutes the inner side of these stripes, as well as the part of the branch deprived of bark, begins to turn red, it is an infallible sign of maturity, and *vice versâ*.

When we take into consideration the immense consumption of Cinchona bark, (Pelletier alone in one year consumed 2000 quintals, equal to 200,000 lbs. of yellow or Calisaya bark, in the manufacture of the sulphate of quinia;) that the trees yielding it are confined to one part of the world; and that no care is taken of their preservation; it is not at all improbable that in a few years this valuable drug may totally disappear from commerce. Indeed a report has been prevalent among the drug dealers, that the *Cascarilloes*, or bark collectors, had arrived at the limits of the forests containing the yellow or Calisaya bark, but whether this be true or false, I know not. I am acquainted with one dealer who has laid in a large stock, on the speculation of the truth of this report.

"If," says Mr. Stevenson, in his Travels in South America, "the government of America do not attend to the preservation of the quina, either by prohibiting the felling of the trees, or obliging the territorial magistrates to enforce cutters to guard them from destruction, before a sufficient population

will allow of those tracts of woodland becoming personal property, this highly esteemed production of the new world will be swept from the country." What Condamine asserts is highly probable, that both old and young trees die from the scaling of the bark, whether they are cut down or not; but Bollus and Arrot assert the reverse: the former states that *Cinchona* trees may be frequently seen deprived of their bark without suffering any detriment; and the latter tells us that from 18 to 20 years are required for a *Cinchona* tree to produce a new bark. When the trees are cut down, Mr. Stevenson tells us that the roots generally sprout, but "no trees of any large size grow up, for they are either smothered by the lofty trees which surround them, or else they are choaked by other young trees which spring up near them, and are of quicker growth."

Physical properties of the Cinchona barks.—Under this head I propose to examine the *structure*, the *quilling*, the *color*, *taste*, and *odor*, the *fracture*, and the *cryptogamic plants*, found on the *Cinchona* barks of commerce.

Structure.—Those barks known to druggists by the name of *coated* barks consist of the following parts—an epidermis, the rete mucosum, and cortical layers, (the innermost of which is termed the liber.)

(a) *Epidermis.*—This is the most external portion of the bark, and is variable in its thickness. The barks of commerce are said to be *coated* (*Cinchona cum cortice exteriore* of Bergen,) when the epidermis is present, but when this is absent, and when also part or the whole of the next layer (rete mucosum) has been removed, such barks are called *uncoated* (*Cinchona nuda* of Bergen.) As the epidermis is useless, or nearly so, in a medicinal point of view, uncoated barks are to be preferred, since the epidermis increases the weight of the bark, without adding any thing to its real value. In reference to this layer, there are several characters deserving of attention in judging of the quality of bark: thus *Cinchona* barks, with a whitish epidermis are, I believe, for the most part, inferior to those in which this layer is brown. But you must not mistake a whitish coating

given to a brown epidermis by some crustaceous lichens, for a genuine white epidermis. The term *warty* or *knotty* (*Cinchona nodosa* of Bergen) is applied to those barks in which we observe prominences on the epidermis, corresponding to elevations on the subjacent parts. These are frequently observed in some specimens of red bark, as well as in the kind called Huamalies. Bark is termed *cracky* or *furrowed* (*Cinchona rimosa* of Bergen) when we observe cracks or furrows (the latter may be regarded merely as larger kinds of cracks) on it. When we observe longitudinal or transverse elevations, we say the bark is *wrinkled* (*Cinchona rugosa*.)

(b.) *Rete mucosum*—*cellular envelope*—*medulla*—*externa*.—This is a cellular layer, placed immediately beneath the epidermis. It is tasteless, and is of no medicinal value. In old barks, (particularly old red bark) it is often much developed: in uncoated bark it is sometimes, though not always absent.

(c.) *Cortical layers* or *cortex*. These are beneath the rete mucosum, and, in fact, form the essential part of the bark. One layer is formed annually, and hence their number, and consequently the thickness of the bark depends on the age of the tree from whence it is taken. The last formed layer, that which is in the innermost, is termed *liber*. Every one of the cortical layers has medicinal virtue, but the liber the most. The reason for this will be readily comprehended by reference to the physiology of exogenous plants. The *succus communis* of these plants ascends by the alburnum, or sap wood, to the leaves, where it undergoes certain changes by the agency of the atmosphere, in consequence of which it is converted into what is called *succus proprius*, the proper juice of the plant, and in which any medicinal activity which the latter possesses usually resides. Now this *succus proprius* descends in the liber: hence this part may always be expected to possess the proper medicinal activity of the tree from whence it is taken.

Cryptogamic plants.—The epidermis of Cinchona barks is frequently covered, either wholly or partially, by cryptogamic

plants. These belong to four orders or families,—namely, Musci, Lichenes, Hepaticæ, and Fungi.

1. *Musci*, or *Mosses*.—We frequently find mosses on Cinchona barks; but as they are never met with in fructification, it is almost impossible to determine the genus to which they belong. They are probably species of Hypnum.

2. *Lichenes*.—These are found in great abundance, especially on the species called *Loxa* or *Crown bark* (the finest kind of pale bark.) We may conveniently arrange them according to Zenker, in four sections:

Sect. 1. *Coniolichenes*, or the pulverent lichenes (*Lichenes pulveracei*).—In this section we have the *Hypochnus rubrocinctus* (classed among the Fungi by Fée.) I have frequently found it on the finest specimens of quilled yellow bark.

Sect. 2. *Cryolichenes* or the crustaceous lichenes (*Lichenes crustacei*).—These frequently put on very beautiful forms, and so color the surface of the epidermis, that they appear to constitute a part of this coat. In that kind of pale bark usually called *gray*, or *silver*, the surface of the epidermis has a whitish cretaceous appearance, from the presence of various species of Arthonia and Pyrenula.

Sect. 3. *Phyllolichenes*, or the foliaceous lichenes (*Lichenes foliacei*).—These are found most abundantly on the *Crown* or *Loxa* bark. The most common species belong to the genera Parmelia, Sticta, and Collema. The *P. coronata* is a beautiful species, and one frequently met with. So also the *Sticta aurata*, remarkable for its yellow color.

Sect. 4. *Drendrolichenes*, or the filamentous lichenes (*Lichenes fruticosi*).—The Usneas are good examples of this section: they are found in abundance on the Crown bark. Two species are met with—*U. Florida*, and *U. barbata*; a variety of the latter is curiously articulated.

3. *Hepaticæ*.—Jungermannias are found on Cinchona barks but in too broken a condition to determine their species. Fée, however, examined Humboldt's Herbarium, and found four.

4. *Fungi*.—As Fungi usually grow on weakly or dead trees,

their presence on Cinchona bark is a bad characteristic. Very few, however, are met with.

Quilling of the bark.—Bark, little or not at all curled, is called in commerce *flat bark* (*Cinchona plana*.) The absence of the curl arises from one of two circumstances,—the age of the stem from which the bark is taken, or the want of flexibility of the bark even in the fresh state. When bark is rolled cylindrically in a quilled form, it is termed *quilled bark* (*Cinchona tubulata*.) Bergen speaks of several kinds of quilling—namely, the *partially quilled* (*Cinchona subconvoluta*,) when the two edges of the quill approximate,—the *closely quilled* (*Cinchona convoluta*,) when the edges of the quill overlap each other, forming a more or less closely rolled up tube,—and the *doubly quilled* (*Cinchona involuta*) when both edges of the quill are rolled together, so as to form two cylinders, but which, seen from the back, appears as one.

Fracture.—The transverse fracture of bark furnishes an important character. Bergen admits three kinds of it: 1st. *smooth, even, or short fracture* (*fractura plana*;) 2dly, *resinous fracture* (*fractura resinosa*;) and 3dly, *fibrous fracture*, (*fractura fibrosa*.) Bark with a resinous fracture is usually to be preferred.

Color, taste, and smell.—Little need be said of these characters. The same kind of bark often varies in its color, while several kinds may have the same tint. Moisture usually deepens the color.

Classifications and varieties of Cinchona barks.—A *botanical* classification of the Cinchona barks I hold to be at present impracticable; and moreover, if it were practicable, it would be, in a commercial and pharmaceutical point of view, useless, since the barks are never accompanied by the other parts of the tree from which the botanical characters are drawn.

A *chemical* classification I also think cannot be at present attempted with any great chance of success. Goebel has offered the following:—

Quantity of alkalies in a
pound of bark.

	<i>Cinchonia.</i>	<i>Quinia.</i>
I. <i>Cinchona</i> barks containing <i>cinchonina</i> :		
(a.) Huanuco, or grey bark,	168 grs.	
II. <i>Cinchona</i> barks containing <i>quinia</i> :		
1. Yellow, or regia bark,		95 grs.
(a.) Flat uncoated pieces,		84
(b.) Coated thick quills,		60
(c.) Thin quills,		
2. Fibrous Carthagena bark, (<i>China</i> } flava fibrosa.)		54
3. Ash bark, (<i>China Jaen</i> .)		12
III. <i>Cinchona</i> barks, containing both <i>quinia</i> and <i>Cinchonia</i> :		
1. Red bark,	65	40
2. Hard Carthagena bark, (<i>China flava</i> } dura.)	43	56
3. Brown, or Huamalies bark,	38	28
4. True Loxa, or Crown bark,	20	16
5. False Loxa bark,	12	9
IV. <i>Cinchona</i> barks containing neither <i>quinia</i> nor <i>cinchonina</i> :		
False cinchona barks,	0	0

This table must not be relied on, since its results do not accord with the experiments of others. We may, I think, presume that all the barks of the three first divisions contain both quinia and cinchonia, but in varying proportions. That the *yellow* or *regia bark* contains cinchonia, every manufacturer of sulphate of quinia knows.

The following is Geiger's arrangement:—

Div. 1.—Cinchona barks, in which the Cinchonia predominates: this includes the Huanuco, Huamalies, Ash, Loxa, and false Loxa barks.

Div. 2.—Cinchona barks in which the Quinia prevails: this includes the regia or yellow bark only.

Div. 3.—Cinchona barks in which Quinia and Cinchonina are contained in nearly the same stoichiometrical proportions: here are placed the red and Carthagena barks.

An arrangement founded on the *physical* characters of the barks will be for the present, perhaps, the most useful, and is the one generally followed. In the "*Versuch einer Monographie der China*," of H. Von Bergen (a work which the late Dr. Duncan, junior, very justly described as "the most perfect specimen of pharmacography" ever published, and from which I shall draw very largely in my descriptions of the barks,) nine varieties of Cinchona bark are described, namely—

1. China rubra, or red bark.
2. China Loxa, or crown bark.
3. China Huanuco, or grey bark.
4. China regia, or yellow bark of English commerce.
5. China flava dura, or hard Carthagena bark.
6. China flava fibrosa, or woody Carthagena bark.
7. China Huamalies, or rusty bark.
8. China Jaen, or ash bark.
9. China pseudo-Loxa, or bastard crown bark.

I am indebted to the kindness of Von Bergen for illustrative examples of these and other varieties of Cinchona, by which I have been able to identify the species with those known in English commerce.

M. Guibourt, in the third edition of his "*Histoire abrégée des Drogues Simples*," has described no less than thirty-seven varieties of Cinchona barks, which he has arranged under five heads:—

1. Grey [or pale] barks.
2. Yellow barks.
3. Red barks.
4. White barks.
5. False Cinchona barks.

By an interchange of specimens, M. Guibourt and myself have been enabled to determine the synonymes of the barks

known in French and English commerce. Lectures, however, are not adapted for entering into an account of all the known varieties, and, therefore, I shall confine myself principally to those commonly used in medicine; in this country, only introducing an account of others when they serve to illustrate the history of the more important ones. I shall adopt the following arrangement:--

Div. I.--Genuine Cinchona Barks.

Section 1.—Having a brown epidermis.

- (a.) Pale barks.
- (b.) Yellow barks.
- (c.) Red barks.
- (d.) Brown barks.

Section 2.—Having a whitish epidermis, (white Cinchona of some authors.)

- (a.) Pale.
- (b.) Yellow.
- (c.) Red.

Div. II.—False Cinchona barks.

Div. I.—*True Cinchona Barks.*

By the terms *true*, or *genuine Cinchona bark*, (*Cinchona vera*,) I mean the bark of some species of the genus Cinchona. Hitherto all these barks have been found to contain one or more of the vegetable alkalies, quinia, cinchonia, or aricina: we presume, therefore, one or more of these to be essential, and perhaps we might also add peculiar, to the genus.

The true Cinchonas are subdivided from the character of their epidermis. In some Cinchona barks, (the Carthagena, for example,) the epidermis is naturally white, has a micaceous appearance, is smooth, not cracked, and adheres to the subjacent laminæ: these are the *white Cinchonas* of some continental writers, (Guibourt, for example.) In other instances the epidermis is naturally more or less brown, cracked, and rugous. Frequently, however, it has a whitish

appearance externally, owing to the adherent crustaceous lichens.

Section 1.---True Cinchona barks, having naturally a brown epidermis.

To this section belong the pale, yellow and red barks of commerce. The following are the characters of each of these sub-sections:—

(a.) *Pale barks (Cinchona pallida.)*—These always occur in quills, never in flat pieces. Their powder is more or less pale, grayish, fawn color, and their taste astringent and bitter. They contain probably both alkalies, cinchonia and quinia, but the first predominates. An infusion of this bark does not affect very obviously a solution of the sulphate of soda, in consequence of containing a very small quantity only of lime in solution. In English commerce three kinds of pale barks are known, namely—

1. Crown, or Loxa bark.
2. Silver, gray, or Huanuco bark.
3. Ash bark.

(b.) *Yellow barks (Cinchona flava.)*—I use the term yellow bark in the sense in which it is employed in English and French commerce: by the Germans and Spaniards, however, the designation of yellow (*flava*) is given to certain barks which have a white epidermis, (namely, the Carthagena barks of English commerce,) and which, therefore, will be noticed presently. The yellow barks of English commerce occur in quills or flat pieces, the quills being, on the average, larger and much rougher than the largest quills of pale barks. The texture of yellow barks is much more fibrous than the pale; the taste is more bitter, and less astringent; the powder is orange or fawn yellow. The principal kind of yellow bark namely, the regia or Calisaya, contains both quinia and cinchonia, but the first in by far the largest quantity. An infusion of this kind of bark precipitates a solution of the sulphate of soda, in consequence of the large quantity of lime in the solution. The only yellow bark which I shall notice, is—

4. The yellow bark of English commerce, called also Calisaya or regia.

(c.) *Red barks (Cinchona rubra.)*—Red bark is met with in both quills and flat pieces: it has a fibrous texture, and a redder color than either of the foregoing kinds: it contains a considerable quantity both of quinia and cinchonia. Only one species here deserves notice, namely—

5. The red bark of commerce.

(d.) *Brown bark (Cinchona fusca.)*—This includes only one species—namely,

6. Huamalies, or brown bark.

(To be Continued.)

MISCELLANY.

New Metal discovered in Sweden, by M. MOSANDER.—M. Mosander has detected in the *cerite* of Bassnæs, the mineral in which cerium was discovered thirty years ago, a new metal to which he has given the name of *lantanium*.

The oxide of cerium extracted from the mineral by the usual means, contains nearly two-fifths of its weight of the oxide of the new metal. It is separated by calcining the nitrate of cerium mixed with the nitrate of lantanum and treating the residue with nitric acid diluted with 100 parts of water; the oxide of lantanum, which is a more powerful base than the oxide of cerium, alone dissolves in the weak acid.

The oxide of lantanum is not reduced by potassium, but this latter separates from the chloride of lantanum a grayish metallic powder, which oxidizes in water with the disengagement of hydrogen gas, and is converted into a white hydrate.

The sulphuret of lantanum is produced by heating strongly the oxide in the vapor of sulphuret of carbon. It is of a pale yellow color, decomposes water with the disengagement of sulphuretted hydrogen, and is converted into an oxide.

The oxide of lantanum is of a brick-red color; it is changed in hot water into a white hydrate, which restores the blue color to reddened litmus. It dissolves rapidly in weak acids, and forms with facility subsalts.

The salts of lantanum have an astringent taste without any mixture of sweetness. Their crystals are commonly of a rose color. The sulphate of potassa does not precipitate them except when mixed with the salts of cerium.

Digested with a salt of ammonia the oxide is gradually dissolved, the ammonia at the same time being set free.

The atomic weight of lantanum is less than that which has been assigned to cerium, that is, to the mixture of the two metals.

Acad. des Scien.

Reagent for Nitric Acid and Nitrogen, by Mr. DESBASSYUS.—To detect the presence of nitric acid in a liquid, several grammes of very pure concentrated sulphuric acid is to be added, and when the mixture is cool, several drops of a concentrated solution of the protosulphate of iron. If

nitric acid be present, the liquid immediately assumes a rose or even purple color, and such is the sensibility of the reagent that one part of nitric acid will color in a distinct manner even 24,000 parts of liquid. This color is due to deutoxide of nitrogen, which is produced and remains dissolved in the excess of the sulphate of iron.

To detect the existence of nitrogen in a gas, it is to be exploded in an eudiometer, along with three or six times its bulk of a mixture of equal parts of hydrogen and oxygen; the instrument is then to be washed with sulphuric acid, to which some drops of protosulphate of iron has been added, and if nitrogen has been present, the small quantity of nitric acid produced by the explosion will be sufficient to produce a distinct color in the liquid.

L'Institut.

On the oil of Mint, and upon a new carburet of hydrogen derived therefrom, by M. WALTER.—Oil of mint, pure and crystallized, melts at 34° c. and boils at 213.5° . It is composed of

C ⁴⁰	.	.	1530.40	.	.	0.7727
H ⁴⁰	.	.	250.00	.	.	0.1262
O ²	.	.	200.00	.	.	0.1011

The density of its vapor was found to be 5.62, the formula gives 5.455.

On adding to this oil small quantities of anhydrous phosphoric acid, until there ceases to be any increase of temperature, distilling and then re-distilling with anhydrous phosphoric acid, we obtain a transparent liquid which boils at 163° c., and which I designate by the name of *menthene*. This substance is composed of

C ⁴⁰	.	.	1530	.	.	0.8718
H ³⁶	.	.	225	.	.	0.1282

I found the density of its vapor to be 4.93 to 4.94; calculation gives 4.835. In evaporating, it becomes brown and slightly altered.

Acad. des Scien.

On a new carburet of Hydrogen, by M. CAHORE.—On treating the oil of potatoes, which is an alcohol, by anhydrous phosphoric acid, and distilling several times from this acid, we obtain a liquid, oily, light, of an aromatic odor, boiling at about 160° , and composed of

C ²⁰	.	.	.	.	0.86
H ²⁰	.	.	.	.	0.14

This is then a true carburet of hydrogen, having the same composition as methylene and olefant gas; and differing but in the state of condensation of its elements. I found the density of its vapor to be 5.06; by calculation it should be 4.904, on the supposition that C²⁰ and H²⁰ represent two volumes.

Ib.

A method to prepare the Sulphate of Iron so as to preserve it always at a minimum of oxidation, by M. BERTHEMOT.—Having dissolved the sul-

phate of iron of commerce in water acidulated with sulphuric acid, and then crystallized, the crystals are to be dissolved in hot distilled water, in the proportion of 500 of the salt to 550 parts of water, and 8 parts of iron turnings to be added. The solution, after a few moments, is to be filtered while yet hot, the filter having been previously moistened with water, to facilitate the passage of the liquid. The solution is to be received in a vessel in which there has been previously placed 375 pints of alcohol of 33°—36°, and 8 pints of sulphuric acid; during which the liquid is to be quickly stirred with a glass rod. The sulphate of iron immediately precipitates under the form of a blueish white crystalline powder, and thus prepared, it is not altered on exposure to the air. It likewise contains the same quantity of water of crystallization as that deposited from an aqueous solution, if the temperature does not exceed 80°, but when boiled with strong alcohol it loses part of this water. *Journ. de Pharm.*

Preparation of pure Narcotine.—DR. O'SHAUGHNESSEY gives the following method for the preparation of narcotine:—The only process yet published by which pure narcotine can be obtained is that devised by Pelletier, but this method, nevertheless, is tedious, troublesome, and apt to fail, unless in very expert hands. I am happy, therefore, in being enabled to propose for the sanction of the Committee a process which is at the same time simple, economical, and productive, which *ensures the separation of the febrifuge narcotine from the powerful sedative morphia*, and which can be performed in every locality where opium can be found. The process is, as far as I am aware, altogether new.

Preparation of Muriate of Narcotine.

Take of Bengal opium	. . . . .	2lbs.
Alcohol	. . . . .	20lbs.

Rub them well up together in a large mortar, adding the spirit by degrees until the opium is exhausted of its soluble parts. Decant the solution and press the insoluble part.

To the alcoholic solution add as much ammonia as renders the liquid slightly turbid. Distil from a common alembic till fifteen pounds of the alcohol are recovered; draw off the fluid in the still and set it aside to cool.

On cooling it deposits a mass of colored crystals composed of narcotine, meconate of ammonia, and resin. Wash with water, which dissolves the meconate of ammonia, then with one quart of water and one drachm of muriatic acid, which dissolves the narcotine and leaves the resin—filter. The solution, which is of a rosy color, is to be evaporated to dryness.

The muriate of narcotine thus prepared is a transparent resinous mass, of a rosy color, brittle vitreous texture, very soluble in distilled water and spirits, and intensely bitter.

A beautifully crystalline muriate of narcotine may be prepared by pre-

precipitating the muriate thus made, by ammonia, and dissolving the precipitate in boiling alcohol, from which the narcotine separates in fine crystals as the solution cools. The crystallized narcotine placed in a tube and subjected to the influence of a stream of muriatic acid gas combines with the acid while it retains its original crystalline form. But this process, though more elegant, is too expensive and elaborate for general use, and the non-crystalline muriate is just as valuable as the more beautiful product now described.

A seer of Bengal opium yields by this process an average of one ounce of muriate of narcotine, and also one ounce of muriate of morphia. Now the seer of opium costs four rupees, the spirit costs one rupee, the ammonia four anas, labor and fuel four anas, or a total of five rupees, eight anas per one ounce of muriate of narcotine, and one ounce of muriate of morphine. The latter salt is in general demand, and its issue from the public stores only limited by its high price. Hitherto it has been imported in small quantities from Europe at the enormous cost of 1*l.* 10*s.* the ounce. Were the Government to sanction the preparation of muriate of narcotine here for the supply of our hospitals, the sale, as surplus stores of a part of the morphine obtained from the same opium at the same time, and by the same process, would, at half the present English price, give the narcotine at *one rupee* the ounce, one-fourth of what quinine at present costs.

Calcutta Quarterly Journal.

Tests for opium,—mode of keeping extracts.—At a meeting of the Medico-Botanical Society, April 10, 1839, Mr. Everitt stated, that having lately had to conduct experiments for the purpose of deciding whether opium were present or not in the stomach of persons on whom a coroner's jury had to sit, he had paid some extra attention to the subject. Generally speaking, in the search after opium, it was the object of the chemist to eliminate the morphia; but it was difficult to decide whether this was present or not, inasmuch as other alkaloids would give the same results when experimented upon. Chemists had long known that meconic acid, when acted upon by a solution of a peroxide salt of iron, was changed to a deep-red color. So far, then, it was a test of the presence of opium. This test, however, was liable to doubt, inasmuch as sulphocyanic acid, which Tiedemann had proved to exist in the saliva, would be acted upon similarly to the meconic acid, on the addition of a solution of a per-salt of iron. Hence, at a trial at Glasgow, in which there could be little doubt that opium was present in the stomach of a person supposed to have been killed, the counsel for the defence of the prisoner objected to the testing of the presence of meconic acid by the solution of iron, on the above ground, and the objection was considered fatal. He (Mr. Everitt) had endeavored of late to obtain, by experiment, the means of distinguishing whether the red color in question was produced by the presence of meconic acid, or of sulpho-

cyanic acid.* After a number of experiments upon this point, he had found that if the red color depended upon the presence of sulphocyanic acid, the addition of a solution of corrosive sublimate had at once an entire bleaching effect upon the tested liquid; while, on the contrary, should the red color depend upon the presence of meconic acid, the solution of corrosive sublimate has no effect. The above test had held good in a variety of experiments in which the tested fluid was combined with various animal secretions, &c.

Mr. Everitt then exhibited a preparation of extract of henbane, which he had kept in a close-stopped bottle for two years; the extract was in a high state of preservation. Previous to placing it in the bottle he had drawn off all the moisture from the extract by placing it under an air-pump with sulphuric acid. Mr. Everitt then threw out some hints on the advantage of keeping extracts free from moisture. *Lancet.*

Dupuytren's Pommade for the Hair.—The following formulæ of this pommade are given, each as genuine, in a late number of the “*Journal de Pharmacie.*”

By M. FONTAINE.

Beef marrow, four ounces;
Calomel, two drachms and a half;
Alcohol. ext. of cantharides, eighteen grains;
Essence of roses, four drops.

By M. CAP.

Beef marrow, two ounces;
Extract of canthar., eight grains;
Oil of roses, one drachm;
Essence of lemon, four drops.

The following, M. Recluz assures us, was shown to Dupuytren himself, at the Hotel-Dieu, and acknowledged by him to be exact.

Beef marrow, six ounces;
*Nervine balsam, two ounces;
Peruvian balsam, two ounces;
Oil of almonds, an ounce and a half;
Ext. of cantharides, sixteen grains;
Alcohol at 30°, one drachm.

Dissolve the cantharides in the alcohol; melt the marrow and the nervine balsam with the oil, and pass them through a fine filter; then agitate until it acquires the consistence of spermaceti, and add to it the Peruvian

* Nearly ten years ago, Dr. O'Shaughnessy pointed out, in *The Lancet*, the fact that the meconate and sulphocyanate of iron might be distinguished from one another by means of an alkaline solution. The sulphocyanate is immediately bleached to a dead pale white by the alkali, while the meconate, on the contrary, becomes deeper in its tint.—ED. LANCET.

* For the composition of this balsam, see “*Edward's Manuel*,” p. 158.

balsam, and afterwards the alcoholic solution. When the pommade has well set, fill two pots, containing each two ounces. *Ib.*

Employment of Sulphate of Quinine in the form of ointment for the cure of malignant intermittents.—DR. ANTONINI, principal physician of the French Army in Africa, extols the efficacy of sulphate of quinine employed in the form of ointment in the cure of malignant intermittent fevers. The following is his formula for the preparation of this ointment:—Take of sulphate of quinine ℥j, alcohol 38° to 40° q. s. (about ℥ij,) acid. sulphur. q. s. (about 80 drops) axung. ℥iv. It is essential that the solution in alcohol be complete and filtered, and that the mixture be made gradually and with care, otherwise the quinine returns to its original condition, and its absorption does not take place. The usual quantity employed at one time is about half an ounce of the ointment, but this dose may be doubled in severe cases.

The mode of applying it is by frictions to the groins, and it is also placed in the axilla. *Journ. des Connaiss. Med. Chirurg.* Oct. 1838.

Formulæ for Syrups of Copaiba.—M. EMILE MOUCHON of Lyons gives the following formula for the preparation of a magnesian syrup of copaiba: R. Bals. Copaib. ℥iv; Magnes. Calc. gr. xxxij; Ess. Menth. pp. gtt. lxiv; Syrup. Simp. ℥lx. Dissolve the magnesia in the balsam of copaiba, and when the solution is complete, add the essence of mint and the simple syrup, triturating them together for a long time. This preparation M. Mouchon states has nearly the appearance of orgeat syrup, and with but little of the taste of Copaiba.

The following is the formula for the gummy syrup of copaiba of DR. PUCHE:—R. Bals. Copaib. ℥ij; Pulv. gum Arab. ℥ss; Aq. Puræ ℥iss; Ol. Menth. pp. gtt. xxxij; Syr. Simp. ℥xij. The balsam of copaiba is to be rubbed up with the water and gum arabic, then the essential oil, and finally the syrup is to be added. An ounce of this syrup contains a drachm of the copaiba. It is said to be better borne by the stomach than other preparations of copaiba. *Journ. des Connaiss. Med.* Nov. 1838.

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ORIGINAL COMMUNICATIONS.

ART. XXXVIII.—OBSERVATIONS ON DEXTRINE AND
DIASTASE. By WILLIAM PROCTER, JR.

Few subjects of the same extent have created more sensation, or have excited more difference of opinion, than *amidon*, and the substances which either constitute it proximately, or are derived from it by chemical agency. Ever since the discovery, by M. RASPAIL, that the grains of *fecula* were real organs, and not a homogeneous proximate principle, as was before supposed, numerous writers and experimenters have engaged in the question as to what is its chemical constitution? And so various have been the views entertained by many of these, that the task now undertaken, which is to give an outline of the history of the subject, and make such experiments as may assist us in arriving at the truth, so far as it has yet been developed, is one that requires no little industry and perseverance.

As early as December, 1825, M. RASPAIL announced, in the *Annales des Sciences Naturelles*,* that *fecula* of potatoes was composed of two parts, one soluble, and the other insoluble in water. This naturalist stated that the last enveloped the

*The short historical notices of the several writers following, were obtained from a paper, by M. Guérin Varry, *Ann. de Chem. et d'Phys.* tome lvi.

first, which he considered to possess all the characters of gum arabic.

M. CAVENTOU, in the *Annales de Physique et de Chemie*, tome xxxi, 1826, contradicts the opinion of M. RASPAIL, and is persuaded that amidon is a proximate vegetable principle, *pure and homogeneous*.

M. GUIBOUT, in the same work, vol. xl, 1829, thought that the two parts of amidon differed more in their form than in their chemical nature, and under this relation he regarded them as constituting only one immediate vegetable principle.

In 1829, M. CHEVREUL, according with the discovery of M. RASPAIL, ceased to consider amidon as one kind of proximate principle, but he did not admit with him that the soluble matter was *gum*, since it did not possess the property of yielding mucic acid, and he designated the soluble part, under the name of *amidine*, and the insoluble portion by that of *amidin*.

MM. BIOT and PERSOZ, (*Nouvelles Annales du Museum*, tome ii, 1833,) fully admit with M. RASPAIL that amidon is composed of two bodies; considering, however, the soluble portion as a pure substance, distinct from *arabine*, to which they gave the name of *dextrine*, by reason that a ray of polarized light deviates strongly to the right in passing through a solid and limpid plate of this substance, or its aqueous solution.

M. BIOT states, in a note attached to the above paper, that to prevent all confusion, M. PERSOZ and himself thought it best to change the name of the soluble matter of fecula, after they had isolated it in sufficient quantities to ascertain all its characters, and to designate it by the property which it possessed of turning the planes of polarization to the right, as has been said, stronger than any other organic substance known.

This power or property, in substances, M. BIOT called *polarization by rotation*, and M. FRESNEL, *circular polarization*.

M. BIOT, in his researches on the rotatory power of various vegetable juices, as beet, carrot, radish, etc., ascertained that this property was increased by boiling the juice with the pulp, and he attributes it to the liberation of dextrine from the

fecula of the pulp. It is for this reason that M. BIOT, believes that boiling roots for feeding cattle increases their power of nourishment, and renders them more digestible.

MM. BIOT and PERSOZ, in their memoir on the modification of fecula and gums by diluted acids, state that sulphuric acid has the power to rupture the teguments of fecula, and liberate the dextrine, when fecula mixed with water is thrown into a boiling mixture of sulphuric acid and water, and the whole mixture then raised to 196° Fahr. They also say, that by boiling the rotatory power is much diminished. When this solution is filtered and added to a large quantity of alcohol, a white flocculent precipitate falls, which is dextrine. When pure dextrine is dissolved in water, and the solution filtered so as to obtain a perfectly limpid solution, and then abandoned to itself, either with or without contact with the air, a white substance gradually precipitates, which has the appearance of inulin. It is not inulin, because, when dissolved in hot water, it turns the planes of polarization to the right, whereas inulin turns it to the left. M. BIOT considers this substance a modification of dextrine.

In conclusion, M. BIOT believed that the acid, by the aid of heat, first ruptured the teguments of the globules of fecula and sets the dextrine free, and then, if the heat was continued, acted on the dextrine, and converted it into sugar of amidon, without the acid communicating any of its substances to the product.

In a letter addressed to the French Institute, 1st April, 1833,* M. GUERIN, announced his having obtained several interesting results with amidon, as follows: that *tegumentary amidon* has the same chemical composition as lignin, and that the *soluble matter* of M. RASPAIL was composed of two substances, *amidine* and soluble *amidin*; the first soluble in cold water, and the second insoluble in water, either hot or cold, but capable of being held in solution through the intervention of *amidine*.

*Annal. de Chem. et de Phys. tome lx, 1834.

MM. PAYEN and PERSOZ, in a letter addressed to the Academy, dated 8th of April, that is to say, eight days after the letter of M. GUERIN, announced the discovery of *diastase*, the active principle of *malt*, and of the property it possessed of breaking or decomposing the globules of fecula, and setting at liberty the soluble matter, or dextrine. "This substance," (*diastase*,) they say in their letter, "contains the less azote as it approaches a state of purity, and possesses besides the following properties: it is solid, white, insoluble in alcohol, soluble in water; its solution is neuter, and its taste marked; it is not affected by the subacetate of lead; abandoned to itself for some time, it becomes acid; heated to 150° or 160° Fahr., with fecula, it possesses the *remarkable power* of breaking, instantly, the envelopes, and setting at liberty the dextrine, which dissolves easily in water, whilst the teguments, insoluble in this liquid, float or precipitate according to the density of the liquor. This operation, properly managed, gives *pure dextrine*, which possesses a great power of rotation, unequalled by that obtained by any other process. When *diastase* is present in a solution of dextrine, it always converts the latter substances into sugar, provided the temperature is not elevated during their contact above 160° or 170° Fahr., because, if heated to ebullition, it loses the property of acting on fecula and dextrine."

"*Diastase* exists in the germinated seeds of barley and wheat, and in the germs or *eyes* of the potatoe, (*Solanum tuberosum*,) where it is always accompanied by an azotized substance which is soluble in water, insoluble in alcohol, capable of being coagulated by heat, incapable of acting on fecula, and of being precipitated from its solution by subacetate of lead."

The following is the process for preparing *diastase* announced by PAYEN and PERSOZ in the same communication:—One part of malt (*d'orge germée*) is reduced to powder, and mixed in two and a half parts of distilled water. After macerating for a few minutes, the mixture must be thrown on a filter. The liquid thus obtained is to be heated to 150° Fahr., when the azotized substance is coagulated, and can be separated by filtra-

tion. The liquid then contains diastase and sugar, in quantity in proportion to the action of the diastase on the dextrine of the malt in the germinating process. It is then precipitated by alcohol, which holds the sugar in solution. This precipitate should be redissolved and again precipitated to obtain it pure.

In a subsequent communication,* PAYEN and PERSOZ state that the soluble matter obtained according to their process is not a pure substance, but is constituted of dextrine, (properly speaking,) sugar, and a substance analogous to inulin.

In a yet more recent communication† PAYEN and PERSOZ declare that fecula is composed of *amidone* and *teguments*, and hence they say amidone is a natural product, and can be obtained by means of water alone.

Amidone is insipid, neuter, without color, diaphanous, elastic, and tenacious. It is insoluble in cold water, but swells exceedingly, and appears in solution; and in this state forms a blue color with iodine, is precipitated by tannin, infusion of galls, subacetate of lead, lime, and baryta. The barytic compound is soluble in an excess of either hot or cold water, and by precipitating the baryta with a reagent, the amidone can be obtained in so minute a state of division that its combination with iodine is not precipitated by saline solutions.

It can be obtained by boiling one part of fecula, in 100 parts of water, filtering through a double filter, and evaporating carefully to dryness; redissolving, filtering, and again evaporating to dryness; the product is amidone.

Diastase, in its action on fecula, converts the amidone into gum, or dextrine and sugar. The dextrine and sugar obtained by diastase, are not precipitated by tannin, subacetate of lead, lime, baryta, or infusion of galls. The sugar can be separated from the dextrine by alcohol of .84. It has a very sweet taste, and ferments with yeast, yielding alcohol and carbonic acid, which is not the case with dextrine. It is dextrine which communicates to beer the mucilaginous property

* Journal de Pharmacie, Mai, 1834 (note by Soubeiran.)

† Annales de Chemie et de Physique, tome lvi, Aout, 1834.

which holds the carbonic acid, and which gives to the froth its persistence.

The teguments contain carbonate and phosphate of lime and silica.

The jelly (*empois of the French*) yielded when fecula is boiled in water, is accounted for by the swelling of the amidone when in contact with the water, after the rupture of the envelopes. When diastase is added to this gelatinous mass, it has the singular property of destroying its spongy organic character, and of rendering it perfectly soluble by converting it into dextrine, and sugar.

In conclusion, MM. PAYEN and PERSOZ remark,—

1st. That the fecula of the grains and potatoes are formed of *amidone* and *teguments*.

2d. That the teguments vary in different feculæ, by the presence and proportion of an acrid, disagreeable, tenacious substance, which communicates to them their special taste.

3d. That in the action of water, lime water, iodine, baryta, and diastase, these substances pass through the envelope.

4th. That amidone is chemically identical in different feculæ, but varies in its volume and cohesion.

5th. That it is *insoluble in the cold*, but allows water to penetrate between its particles, and swell them by degrees.

6th. That it is spongy in its texture, and when considerably broken up by strong ebullition, in 100 times its weight of water, it appears to be really dissolved, and passes the filter.

7th. That the previous observations explain the formation of jelly, and its different characters when obtained from different feculæ.

8th. That the teguments, entirely deprived of amidone, do not yield a blue color with iodine.

9th. That amidone *alone*, in fecula, produces alternately, the phenomena of coloration and decoloration, of opacity and diaphaneity, by iodine, alcohol and water.

10th. That amidone *only* of fecula, is transformed into sugar, and gum, by the influence of diastase, water, and temperature,

and that the sum of the weights of the sugar, and gum, or dextrine, equals the weight of the amidone.

11th. That in the preparation of beer, it is important to effect the entire transformation of the amidone, into dextrine and sugar; so that the transparency of the fluid will not be troubled afterwards, which would be the case if amidone was present.

12th. That in the first developement of certain plants, the diastase is placed precisely at the point where the fecula ought to be rendered assimilable so as to transform the insoluble fecula into two soluble substances, capable of being absorbed by the plant.

13th. That diastase only transforms amidone, as it is without action on gum, (properly so called,) inulin, albumen, gluten, teguments, and lignin.

14th. That during the process of germination, the proportion of the diastase increases with the developement of the gemmule.

15th. That amidone forms about .995 of fecula, while the teguments deprived of all amidone make up the remainder.

Finally, that diastase has become an important agent in the chemical analysis of fecula, and forms an easy means of making commercial dextrine.

M. GUERIN says, that he followed M. CHEVREUL in naming the principles which he has described,* that is to say, *amidine* to the portion of fecula soluble in cold water; *tegumentary amidin* to the part insoluble in either cold, or boiling water; and *soluble amidin*, to prevent all confusion, to the part which is held in solution by amidine, and which is identical in chemical composition with tegumentary amidin.

The amidine of GUERIN, is made by boiling fecula in a large quantity of water for a short time, allowing it to stand until the teguments precipitate, filtering, and evaporating the filtered liquor to a syrupy consistence, when a precipitate gradually forms, which is to be separated by a cloth, and the

*Annales de Chim. et de Physique, tome lvi.

liquid again evaporated, continuing the process, until it ceases to yield the insoluble matter. When finally evaporated to dryness, the residue is completely soluble in cold water. M. BIOT found a solution of this substance to possess the rotatory power three times more powerfully than sugar.

It renders cold water very mucilaginous, is insoluble in alcohol and sulphuric ether: its aqueous solution becomes acid, after standing many days, and its transparence is troubled.

Treated with nitric acid, it gives first oxalhydric, and afterwards oxalic acid.

100 parts of amidine, and 250 parts of sulphuric acid, at about 150° Fahr. have yielded 95.8 parts of anhydrous sugar.

M. GUERIN says that this substance differs much from the dextrine of BIOT and PERSOZ, because, according to their memoir, they assign as one of its chemical characters, fermentation with yeast, which amidine does not. He prepared some of their dextrine, and found that it did ferment with yeast; but suspecting that it owed this property to sugar, he treated it with alcohol and found that it lost this property, and acquired that of coloring blue with iodine, instead of vinous red or purple. Thus deprived of sugar by alcohol, continues GUERIN, it is yet composed of two substances, one soluble and the other insoluble in cold water. BIOT and PERSOZ say, that their dextrine is the same as that made with boiling water alone, which corresponds with the declaration before mentioned of PAYEN and PERSOZ, that the substance obtained by diastase is composed of dextrine, sugar, and substance analogous to inulin.

Tegumentary amidin, of GUERIN, dried at 212° Fahr. has a light yellow color, neither odor, nor taste, without action on paper reactives, gives a beautiful blue color with iodine, is insoluble in water, either cold or boiling, alcohol, or sulphuric ether, and when left long in contact with water, swells, but is not altered.

Soluble amidin, of GUERIN, is the substance precipitated from the aqueous solution of amidon, in the process for preparing amidine; and according to that chemist, it is chemically

identical with tegumentary amidin. He also observes that fecula is composed of—

Tegumentary amidin,	2.2	} 100.00
Soluble amidin,	38.68	
Amidine,	59.12	

GUERIN also queries whether his tegumentary amidin is identical with lignin, and owes its property of coloring blue with iodine to a small quantity of adhering amidine, or whether it is merely isomeric with that substance.

We have now gone over most of the writers on the subject before us, and have unfolded their several views as concisely as possible. It now remains to give the ideas of M. RASPAIL, the latest writer on the subject, whose work has come to hand. He differs widely in his opinions from most of those which we have detailed, and it is proper that they also should be exposed; avoiding, however, the many sarcastic remarks with which his pages are interspersed, we shall endeavor to place his views in as clear a light as possible.

According to this writer, fecula consists of soluble matter and teguments; the latter enveloping the former; the one entirely insoluble in water, and the latter very soluble in that fluid. To the soluble matter he gave the name of *soluble substance of fecula*; and to the insoluble portion, *teguments*; stating, at the same time, that the latter consisted of the outer envelope, and an interior tissue, which, from its extreme tenuity, was capable of being diffused through the solution of the soluble substance, so as to appear in solution, though it really was not, and in time was wholly deposited.

He queries what is the *dextrine* of BIOT?* and answers that it is the *soluble substance* of fecula.

He again queries what is the *diastase* of PAYEN and PERSOZ? after speaking of the unhappy application of this word to the substance in question, which signifies division, or separation, and is already used in chirurgy to signify *luxation*, he remarks, that the diastase of these chemists is distinguished

*Nouveau Systeme de Chimie Organique, tome i, art. Amidon.

by two properties new in science, and extremely remarkable: the first is its power of breaking the integuments; the second is that of saccharifying fecula. Now unhappily the first property is possessed by pure water, which, when heated to a certain degree, and fecula is thrown into it in small quantities, the envelopes are burst, and the soluble substance is liberated. After standing, the teguments subside.

“The second property,” continues RASPAIL, “which consists in saccharifying fecula, is highly interesting, and is incontestible, but unfortunately it is nothing new. It belongs in justice and without any modification, under an economical relation, to those who have invented and perfected the art of fabricating beer; and under a scientific relation, to KIRCHOFF, who demonstrated by the most varied experiments, the influence that, not only glutinous substances, but solution of malted barley, that is to say, germinated barley, exercised on the saccharification of fecula.”

PAYEN and PERSOZ say, that their diastase is not gluten, because it is soluble in water, which is not the case with that substance.

RASPAIL then observes that “gluten is soluble to a certain degree in water saturated with an acid, or ammonia; now in organized nature so abundant in acid, and ammoniacal products, gluten ought often to be presented under this soluble form, and it has not escaped anterior observations. Thus, before the name of *diastase*, it had received the name of *soluble gluten*, properly so called by EINHOF and BERZELIUS, that of *zimome* by TADDEÏ, and that of *legumine* by BRACONNOT.

RASPAIL then remarks that in 1826 and 7 he demonstrated that grain, in germinating, produces an energetic acid, which is the acetic, and that then the gluten loses its consistence, and the feculent perisperm becomes milky, which is affected gradually by the acetic solution of gluten, and the teguments are emptied of the soluble substance. The results of the action of gluten on fecula, is to transform it into sugar, then into alcohol, and lastly into acetic acid. The brewers arrest the fermentation at the two first phases. They cause the barley

to germinate until the plumule has attained a little greater length than the grain, then dry it and reduce it to powder, and then dissolve it in warm water. The meal thus obtained is *malt*, and the solution, which is the saccharifying agent of the brewers, is the *diastase*, the *zimome*, and the *legumine* of others. The diastase, therefore, of PAYEN and PERSOZ, is only a mixture, more or less variable and complex, of sugar, gum, soluble substance of fecula, oil, salts, and finally gluten, to which belongs specially the saccharifying power. Again our author queries:

“What is the *amidine* of GUERIN?”

“It is the *soluble substance* that we have discovered in fecula, that we have designated under the name *gummy substance*, to which BIOR has believed it his duty to give the name of *dextrine*, a name which PAYEN and PERSOZ have added to the soluble substance altered by the malt of beer, which they have since abandoned for that of amidone.” This is incorrect, as they do not use diastase in the preparation of amidone.

“What is the *tegumentary amidin* of GUERIN?”

“It is the assemblage of the envelopes of fecula, that we have designated under the name of *teguments*.”

“What is the *soluble amidin* of GUERIN?”

“It is the same, according to him, as tegumentary amidin, which amidine holds in solution, and which according to the same author is identical in all its relations with tegumentary amidin; thus we have two substances which are identical, and different, and one substance which changes its name according as it is dissolved or undissolved.”

“It is the interior tissue spoken of before, which from its extreme tenuity passes the filter, and appears dissolved, but which precipitates by time, that GUERIN has given the name of soluble amidin.”

Perhaps it will give a better idea of these substances by presenting them in the following classification, viz.:

RASPAIL,	teguments,	interior tissue,	{ soluble substance or gummy substance.
BIOT & PERSOZ,	teguments,	{ substance ana- logous to inulin,	dextrine.
GUERIN,	{ tegumentary amidin,	soluble amidin,	amidine.
PAYEN & PERSOZ,	teguments,	amidone	
		substance analogous to inulin.	dextrine or gum.

By scrutinizing the foregoing remarks, we will observe a great confusion of names, indeed almost as many sets of names as we have experimenters on the subject. There is evidently an analogy between some of the results, and the probability is, that the amidine and soluble amidin of GUERIN, taken together, constitute the amidone of PAYEN and PERSOZ, as both amidine and amidone, color blue with iodine, and both are obtained without the use of any other agent but water and temperature. The matter of amidone which causes it to swell, may be a tissue-like substance, which, when separated by ebullition, etc., constitutes the soluble amidin held in solution by amidine of GUERIN.

I think we may safely differ from RASPAIL, who considers the dextrine by sulphuric acid of BLOT, to be the soluble substance of fecula. Dextrine when obtained in that way, as well as by diastase, gives a vinous red or purple hue with iodine, while the substances which are derived directly from fecula by water give a sky blue.

RASPAIL says, that all, save the teguments of fecula, is soluble substance, an assertion which is not borne out by fact, for we find that amidone is not soluble.

He also asserts, that diastase is soluble gluten, or gluten held in solution by acetic acid. Wishing to test the truth of this assertion, some gluten was prepared and dissolved in acetic acid. This, then, should possess the power of diastase. Two drams of fecula were mixed with two ounces of water, and as much solution of gluten as equalled two or three grains of the undissolved substance was introduced along with it, and

the temperature raised expecting to see the reactions peculiar to diastase, but was somewhat disappointed when the mixture became gelatinous and exhibited no signs of alteration. At this crisis half a grain of diastase was added, dissolved in a very minute portion of water; the mixture in a very short time was sufficiently fluid to filter. If the acetic acid solution of gluten was prepared correctly, and there is every reason to believe that it was, this assertion of RASPAIL proves incorrect.

RASPAIL also asserts, that diastase and sulphuric acid possess no power of rupturing the envelopes of fecula, but that it is due to the water and temperature. To ascertain how far this was correct, 240 grains of fecula about 1000 grains of water, and half a grain of diastase, were mixed together, and heat gradually applied. At the temperature of 150° Fahr., the mixture had a gelatinous consistence owing to the rupture of the envelopes, and the liberation of the interior substance. Again; the same quantities of fecula and water were mixed together *without* the diastase, and the temperature raised as before. At 150° Fahr., the mixture becomes gelatinous as in the other case. To this one-third of a grain of diastase mixed with half a dram of water was added, and the whole stirred together. In a very short time, the mixture lost its jelly character, and was quite fluid. From this it may clearly be inferred, that water and temperature, as has been said by RASPAIL, are *really* the agents which rupture the envelopes. It may be well to remark, that the jelly of that in which diastase was used, was not so thick as the other, which may be traced to the immediate action of the diastase on the first portion of broken granules.

Preparation of Dextrine.

First, by sulphuric acid.

The proportions recommended by different chemists are exceedingly variable, as are the processes. Berzelius directs.

Fecula	50 parts.
Acid	20 “
Water	139 “

Mix the fecula with one-half of the water, and the acid with

the other; first heat the diluted acid, and add the fecula and water, in small quantities at a time, then raise the temperature to ebullition, and keep it there a few minutes. Afterwards saturate the acid with marble dust; filter, and evaporate carefully to dryness.

*THENARD says, take one hundred parts of fecula, twenty-eight of water, and twenty of acid, which is evidently a mistake, as the quantity of water is entirely too small. The dextrine obtained by the process of BERZELIUS is very soluble in water, and colors vinous red with iodine. According to M. T. THINUS, (*Journal de Pharm.* tome xx,) the following are the most eligible proportions:

Fecula	50	parts.
Acid	10	“
Water	600	“

I have used these proportions in preparing it, and found them to answer very well; mix the fecula with one-half of the water, and the acid with the other, and apply heat, taking the precaution to keep the mixture in constant agitation, at 150° or 160° Fahr., the whole becomes a jelly, which gradually becomes more fluid, until the temperature arrives at 196°. Keep the mixture at this degree for some minutes, and then allow it to stand twenty-four hours, when it is to be filtered. On adding an excess of alcohol to this solution, the dextrine is precipitated in a flocculent state, which aggregates in a cohesive mass. Thus obtained, it retains a small quantity of sulphuric acid, mechanically, which by re-dissolving in a small quantity of water and again precipitating, yields the dextrine pure.

This process might be altered so as to saturate the acid with marble dust, and evaporate the solution to dryness, after filtering.

2d. A much easier, and more eligible process is that in which diastase is used as the agent. The following proportions have yielded a satisfactory result, viz.:

Diastase	1	part.
Fecula	400	“
Water	1200	“

Dissolve the diastase in the water, then add the fecula, and raise the temperature gradually, stirring the mixture constantly. At 150° the whole becomes a mass of thick jelly, which liquifies entirely between 150° and 160° Fahr. When this has taken place, raise the temperature of the mixture rapidly to ebullition, which suspends the action of the diastase on the dextrine. Floating through the liquid is seen a flocculent substance, which is composed of the empty teguments, upon which the diastase has no action. After the liquid has cooled, filter it, and either precipitate with alcohol, or evaporate carefully to dryness. The advantage of using the alcohol is the separation of the sugar, which invariably attends the action of diastase.

I think that we may draw from the foregoing exposition the following conclusions, viz.:

1st. That fecula consists of teguments, which envelope a peculiar substance of a spongy character, which is either one uniform matter, or composed of a soluble and an insoluble substance united.

2d. That dextrine, or gum of fecula, is always a product of art, and is derived from the interior substance of fecula, by the action of different agents.

3d. That diastase and sulphuric acid, and other agents, that are thought to exercise the power of rupturing the envelopes of fecula, do not really possess that power, but the water and temperature cause them to be ruptured, and then these agents act on the interior substance, and convert it into dextrine and sugar of amidon, thus destroying the gelatinous consistence of the mixture.

4th. That diastase is not soluble gluten, as asserted by RASPAIL, but is a substance enjoying the power of converting the interior substance of fecula, first into dextrine, and afterwards into sugar of amidon.

ART. XXXIX.—OBSERVATIONS ON LOBELIA CARDINALIS.

By WILLIAM PROCTER, Jr.

LOBELIA inflata is the most important individual of this genus, yet thinking that the plant under consideration might possess a similar constitution, though less active, the following experiments were undertaken to ascertain the truth of that supposition.

The sequel will demonstrate, that the active principle of this plant possesses many of the characteristics of *lobelina*, the active portion of *Lobelia inflata*, while the medicinal power of the one is so inferior to that of the other, as to warrant the existence of two distinct principles.

BOTANICAL HISTORY.

LOBELIA cardinalis.

Natural Family *Lobeliaceæ*, of JUSSIEU and LINDLEY.
Pentandria monogynia, of LINNÆUS.

This genus is distinguished by a five-cleft calyx, five-parted corolla, irregular, cleft on the upper side nearly to the base; anthers cohering; stigma two-lobed, and capsules two or three celled.

Vulgar names. Cardinal Plant, Cardinal Flower, and Scarlet Lobelia.

Lobelia cardinalis. This plant has a fibrous root, similar to that of other species of the genus, which is whitish yellow, having a nauseous disagreeable taste, somewhat similar to that of the *inflata*, though in an inferior degree. The stem is erect, simple, pubescent; leaves lance-ovate, acuminate, denticulate; racemes somewhat one-sided, many flowered; stamens larger than the corols.—EATON. BARTON. The whole plant emits a milky acrid juice when wounded, though the root is more pungent than any other portion.

This plant, in favorable situations, sometimes attains the height of four feet, though generally not more than two. It grows in wet or very damp places, along the margins of

streamlets, and is one of the most showy of our native plants. It blooms from the last of July till September.

This plant has attracted little notice in a medicinal point of view; its chief claim as a remedial agent seems to be the anthelmintic powers which are ascribed to it by the Cherokee Indians. Dr. W. P. C. BARTON, however, from all he has learned, considers it deserving of further attention from medical practitioners.

CHEMICAL HISTORY.

As it is interesting, as well as sometimes important, in a chemico-botanical point of view, to be acquainted with the proximate constituents of plants that exist independently of the active principle, it may add to the interest of this statement to enumerate the experiments that have been made to ascertain them.

1st. A concentrated decoction of the plant was treated with ferrocyanuret of potassium, bichloride of mercury, iodine, and solution of gelatin, without producing any alteration, and hence it contains neither vegetable albumen, starch, nor tannin.

2d. When the subacetate of lead is added, a precipitate, the compound of oxide of lead and *gum*, immediately is separated.

3d. A portion of the plant was subjected to distillation with water: the product was devoid of taste, but had a very slight odor, so that volatile oil, if a constituent, exists in very minute quantity.

4th. Half an ounce of the plant was macerated in four ounces of alcohol, 36° Baumé, for three days; part of this tincture was subjected to distillation till half reduced, the residue was mixed with twice its bulk of water, when a copious precipitate of green resin and chlorophylle resulted, which was separated by a filter. The distilled liquid, which was nearly pure alcohol, had very little if any odor that did not belong to that fluid.

5th. A portion of the plant was macerated in sulphuric ether, and the ethereal tincture evaporated; the residue was

of a dark green color, communicated a permanent greasy stain to paper, and was evidently a combination principally of oily matter, and chlorophylle.

Four ounces of dried *Lobelia cardinalis*, were macerated for twenty-four hours in twelve ounces of water, acidulated with half a drachm of acetic acid; and then thrown on a displacement filter, and treated with water, till twelve ounces of fluid were obtained. This liquid had an unpleasant narcotic odor, and a disagreeable taste. It was then treated with pure magnesia to saturate the acid and again filtered. The product was then treated with sulphuric ether, 60° Baumé, the whole being well agitated together, and allowed to rest. The supernatant ethereal solution, which possessed a gelatinous consistence, was then decanted, and after standing a few hours regained its fluidity. This, when evaporated, yielded a small quantity of light brown matter, which was possessed of the following characters.

It had a bitter, acrid taste, sensible for some time in the mouth, slightly affecting the fauces, in which respect it differs from *lobelina*, which pointedly effects that part. It has a somewhat aromatic odor; the consistence is that of thick honey; and after a long exposure to the atmosphere, it evinced no disposition to crystallize, though it gradually became less fluid. This substance has a very decided alkaline reaction on reddened litmus paper, saturates acids, and with them forms crystallizable salts. It is very soluble in ether, alcohol, and oil of turpentine, but less so in water. Its specific gravity is greater than water, as it sinks rapidly in that fluid. When heated gently on the point of a rod, it becomes perfectly fluid, and when a lighted taper is applied it burns freely with a light flame.

It combines with acids as follows:—

The sulphate is in acicular crystals, devoid of odor, but retaining a taste similar to its base, and very soluble in water.

The nitrate takes the form of prismatic crystals, thicker than those of the sulphate and very soluble in water.

The hydrochlorate readily crystallizes in flattened needles

radiating from a common centre, and like the rest very soluble in water.

The acetate is more soluble and less disposed to crystallize than either of the other salts.

The great similarity between this principle and lobelina makes it a matter of some interest to be able to draw the line of distinction between them, so as to ascertain whether they are in reality but one substance, or two.

To do this with satisfaction, it would require much larger quantities of the plant than has been the subject of these experiments, so that the amount of active principle would justify a more extensive scrutiny than I have been able to make.

The root evidently contains a greater proportion of this principle than the upper part of the plant, and it is probable that the seeds are yet more active though they have not been tried. Should future experiments demonstrate the identity of the two principles, the name is already given, but if the contrary, *lobeliana* might be a suitable cognomen.

From the foregoing remarks the principle constituents of *Lobelia cardinalis* are gum, resin, or *chlorophylle*, probably volatile oil, fixed oil, and a peculiar alkaline principle, to which may be added salt of lime and potassa and lignin.

ART. XL.—REMARKS ON BROWN MIXTURE.

By AUGUSTINE DUHAMEL.

THERE is a preparation, in general use in this city, which, though not officinal in any of the Pharmacopœias, may yet be found in almost all of our drug stores. It is a compound solution of Liquorice, otherwise called *Mistura Fusca*, or Brown Mixture, under which name it is best known, and is extensively used to alleviate the distressing symptoms of cough.

Desirous of learning its origin, with the view of procuring a well authenticated formula, I sought in vain for some printed treatise that might elucidate the object of my search. Although prepared by nearly all our apothecaries, very little is known by them respecting its origin. The little information I have gathered in relation to its source, I owe to the politeness of Mr. FREDERICK BROWN, from whom I have obtained the following:

“Professor BENJAMIN SMITH BARTON, of the University of Pennsylvania, in the year 1814 or 15, wrote a prescription for a patient afflicted with cough,—and being pleased with its effect, requested CHARLES MARSHALL, Sr., of No. 56 Chesnut street, to keep it ready, and to his store the Doctor’s patients were always sent for it. The Doctor, wishing to call it by a name that would only be known to himself and the apothecary, after some difficulty, fixed upon the name of *Brown*, from its color. This mixture, it was said at the time, was the means of patients, afflicted with coughs, consulting the Doctor. He occasionally varied the quantity of antimonial wine to suit the case. After his death it was continued under the name of Barton’s Brown Mixture, until about the year 1822, when his name was dropped.”

It has ever since been much in vogue as a popular cough medicine, and now constitutes one of the regular, or, to speak more properly, one of the *irregular* preparations of the shop. Among the number of recipes which I have procured from different druggists, I scarcely found two to accord exactly

in their proportions and method of preparation. To exhibit the disparity that exists in preparation, I shall give the recipes that have been furnished me by six of our principal druggists.

<i>No. 1.</i>		<i>No. 2.</i>		<i>No. 3.</i>	
Powdered Gum Arabic,	4 drachms,	4 drachms,		4 drachms.	
Powd. Ext. of Liquorice,	4 “	4 “		4 “	
Elixir Paregoric,	2 ounces,	2 ounces,		2 ounces.	
Antimonial Wine,	1 “	1 “		1 “	
Water,	14 “	12 “		Hot water,	14 “

The three above mentioned formulas emanated from the store of the said CHARLES MARSHALL, Sr., and are such as the three former assistants of Mr. M. now pursue in the preparation of their Brown Mixture, and are the only ones that have any claim to originality. The ingredients are the same in the three, but differ in a small degree from each other in the quantity and temperature of the water to be employed.

The three following differ more materially.

No. 4.

Powdered Gum Arabic	1 ounce.
Powd. Ext. of Liquorice	4 drachms.
Paregoric	1½ ounces.
Antimonial Wine	6 drachms.
Water	14 ounces.
Sugar	1 “

No. 5.

Powdered Gum Arabic	1 ounce.
Powd. Ext. of Liquorice	1 “
Paregoric	2 “
Antimonial Wine	1 “
Water	16 “
Sugar	2 “
Spirit of Nitre	4 drachms.

In preparing this mixture, the following directions are observed. Rub the gum, sugar, and liquorice together in a

mortar, and add the water, by small portions at a time, until the whole is dissolved: then add the paregoric, antimonial wine, and other ingredients, and shake the whole together.

No. 6.

Gum Arabic	4 drachms.
Extract of Liquorice	6 “
Paregoric	4 “
Antimonial Wine	2 “
Hot Water	12 ounces.

Dissolve the gum and liquorice in lumps, by means of the hot water; then throw upon a filter, and afterwards add the other ingredients to the filtered liquid.

Brown Mixture, as commonly made, may be considered a very inelegant preparation, and is subject to several objections in a pharmaceutical point of view. The principal of these are its extreme turbidness, aptitude to spoil, and want of uniformity. The powdered liquorice employed for this purpose is the liquorice of commerce, containing such impurities as starch, and insoluble carbonaceous matters independent of the copper with which it is invariably found contaminated. The design of recipe No. 6 is no doubt to get rid of these impurities by filtration: but this I found impracticable on account of the gum which fills up the pores of the paper, rendering it impervious. The solution of the extract alone is very difficult to filter: the liquid passes very slowly, leaving behind a large quantity of the liquorice undissolved. After the Brown Mixture has been suffered to remain at rest for some time, much of the liquorice, including the insoluble portion, is deposited, the proportion of gum not being sufficient to keep it in suspension, which has led to the custom of first shaking the bottle, before giving the mixture, which is then thick and turbid. If there be a considerable increase in the quantity of gum, the mixture sooner decomposes, and, to remedy this, some make a large addition to it of paregoric and antimonial wine, which, besides giving a greater anodyne effect than intended, throws down some of the gum and liquorice. During hot

weather it undergoes fermentation, under which circumstances it is required to be made in smaller quantities. Feeling the inconveniences of this, apart from the impolicy of offering to our customers a preparation of so ungainly an appearance as the ordinary Brown Mixture, we some time ago set about improving the formula, and as far as regards elegance of appearance, efficiency and permanency, no doubt is left upon our mind of having devised a vastly superior preparation. For this purpose we have brought to our aid the favorite system of displacement. In the desire of ascertaining the value of this principle, considered in relation to its means of furnishing an extract of greater purity than the commercial liquorice ball, made by decoction, we have had recourse to the experiments of Mr. GUILLERMOND, made upon this substance, through which we arrive at the following details:

Liquorice Root in coarse powder 330 parts.

Maceration and expression with 1560 parts of cold water gave 59 pts. ext.

Displacement	"	1200	"	"	"	"	98	"	"
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Maceration and displacement	"	1400	"	"	"	"	79	"	"
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Maceration and expression	"	720	"	alcohol 22°	"	"	37	"	"
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Displacement	"	600	"	"	"	"	37	"	"
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Maceration and displacement	"	680	"	"	"	"	38	"	"
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A glance at these experiments helped us to the immediate conclusion, that a highly concentrated and very limpid solution of all the soluble principles of liquorice root, as obtained by displacement, and embodying as it does a greater quantity of pure extract and *glycyrrhizine*, or the sweet principle of the root, to which it owes its demulcent properties, was far preferable to an imperfect solution of the common extract, containing impurities of various kinds to a considerable extent. The correctness of this judgment will be more readily conceded, upon viewing in connection with these experiments the analysis of this root.

According to Mr. ROBIQUET, liquorice root contains—1st, starch; 2d, albumen, coagulable by heat; 3d, woody fibre; 4th, phosphate and malate of lime and magnesia; 5th, a brown and thick resinous oil, to which liquorice owes its acidity; 6th a

peculiar uncrystallizable principle of a sugary taste, (glycyrrhizine,) soluble equally in water and alcohol, differing from sugar in not undergoing the alcoholic fermentation, and not producing oxalic with nitric acid; lastly, because it forms, with the acids, compounds, not very soluble in water.

From this it will be seen, that by treating liquorice root by displacement, we get all the soluble active principles of the root: and as it is alleged on high authority that the demulcent properties of the different kinds of extracts of liquorice are principally owing to the proportion of *glycyrrhizine* contained in them, consequently, the more of this substance in a pure state the solution may contain, the greater will be its efficacy. Again, by the cold water treatment, instead of boiling or using the extract made by decoction, we not only avoid the starch, but what is more desirable, we get rid of the oleo-resinous acrid principle, which is insoluble by itself in the cold water, and only dissolves along with the other principles, by heat, and then in proportion to its increase.

Having stated these preliminaries, it now remains to give the formula which we have adopted.

Take of finely bruised liquorice root,	.	.	.	1lb.
“ Powdered extract of liquorice,	.	.	.	℥j.
“ Water,	.	.	.	q. s.
“ Gum Arabic,	.	.	.	℥iv.
“ Paregoric Elixir,	.	.	.	℥j.
“ Antimonial Wine,	.	.	.	Oss.

Mix the liquorice powders together, with sufficient water to render the whole thoroughly moist; afterwards place them in a BOULLAY'S filtering instrument, and operate by displacement with the remainder of the water, until you have obtained seven pints. Then take the gum arabic, in lumps, which you will dissolve in half a pint of the liquorice solution, and add it to the remainder, together with the paregoric and antimonial wine; lastly, shake, that the whole may be intimately mixed.

The above formula corresponds with the original, as far as regards the proportion of ingredients. According to the table, 330 parts of root gave 98 of extract, which, in the same ratio

would require $13\frac{1}{2}$ ounces to produce 4. But as we may suppose the quantity obtained by Mr. G. is the maximum product, and from liquorice of the best quality, and as that which we receive here is more or less old, and sometimes of impaired quality, we have lowered the standard so as to ensure an equal amount of extract from a greater quantity of substance.

The object of the liquorice extract mixed with the root is to impart the requisite degree of color.

The addition of the paretoric to the solution renders it slightly turbid at first, but it becomes clear soon after.

Brown mixture, thus prepared, is limpid, very sweet to the taste, of a deep reddish-brown color, and may be kept for an indefinite period without spoiling.

SELECTED ARTICLES.

ART. XLI.—ON THE RECTIFICATION OF ALCOHOL.

By M. SOUBEIRAN.

THE difficulties experienced in procuring large quantities of highly rectified alcohol, and the loss which accompanies the processes commonly employed, have induced me to undertake some researches upon these processes. I have obtained satisfactory results, by which science will be somewhat benefited; for, it is well known to what extent a higher or lower degree of rectification modifies the solvent properties of alcohol, and hence, many researches have been abandoned or have afforded no results, from the difficulty of obtaining easily and abundantly this liquid in a high state of concentration.

The rectification of alcohol of commerce, or of 86° , by simple distillation, without the assistance of any foreign substance, is the most common mode in use, in the laboratories of pharmacutists; and I can declare this to be the only method to which we can have recourse, when we wish to preserve the original sweetness of the alcohol; and it is this which should be employed in pharmaceutical preparations. This preference is not necessary when rectified alcohol is to be obtained for chemical operations.

It is known that Baumé, by successive distillations, and by dividing several times the products, could not obtain alcohol above 92.6° : which he called highly rectified alcohol.

Those substances destined for the rectification of alcohol, to be suitable for the purpose, should unite, to the condition of a strong affinity for water, that of not effecting any alteration in the alcohol. I first used the sulphate of soda, but with bad suc-

cess; only one trial was made, but that was not of a nature to afford any encouragement to continue. Three pounds of alcohol of 82.5° were put in contact with 500 grammes of effloresced sulphate of soda; the temperature was 9° c.: twenty-four hours after the alcohol marked 83.7° , I placed the mixture on a stove to facilitate the action; a temperature of 35° c. sustained for twenty-four hours, had raised the alcohol to 84.9° c. only; I then slowly distilled the alcohol from the salt, and obtained a product of 87.1° c.

Fused chloride of calcium, which is frequently used in France, readily raised the alcohol to an advanced point of rectification; but when we charge ourselves with the expense of the fire necessary for the fusion of a large quantity of the chloride, and beside consider the quantity of the product, we will quickly perceive the losses which result from the use of this salt; a result which is well known, and is confirmed completely by the following experiments:

I put 700 grammes of the fused chloride of calcium in 7 pounds of alcohol of 91° . When it was dissolved, I slowly distilled, and continued the operation as long as anything came over; I obtained $6\frac{1}{4}$ pounds of product, of 95.2° . The 7 pounds of alcohol of 91° contained 6.37 pounds of absolute alcohol; 6.25 pounds of 95.2° contain 5.93 pounds; consequently the loss was 0.42 of a pound.

The loss was much greater in the second experiment, in which a larger quantity of the chloride was used; to five pounds of alcohol at 86° , there were added 1.250 grammes of fused chloride; after twenty-four hours it was slowly distilled, and the distillation continued until no more passed over; the products separated, as they were distilled over, marked successively 95.6° , 95.6° , 95.6° , 95.6° , 95.6° , 95.6° , 95° , 95° , 94° , their mixture formed four pounds of alcohol, of 95° . Thus, for 4.30 pounds of absolute alcohol contained in the quantity acted upon, 3.80 pounds were procured in the product; 0.50 pounds remaining in chloride of lime.

The acetate of potassa possesses but slight advantages for the rectification of alcohol; I shall content myself with report-

ing the results of one experiment. I added one killogramme of fused acetate of potassa, to four pounds of alcohol, of 86° , and distilled slowly; so soon as the acetate was dissolved, on dividing the product, I obtained successively, alcohol of 92.5° , 93° , 93.5° , 93.5° , 93.5° , 93.5° , 93.5° , 93° , 93° , 93° , 93° , 93° , 93° , 92.75° , 92.75° , 92.50° , 92° , 90.5° , 72° , 43° . All the products when mixed, yielded an alcohol of 93° .

The use of quick-lime as an agent in rectification, has given the most advantageous results; it separates surprisingly the water from the alcohol, but it will be seen that it is far from sustaining all which it at first promised. I will begin by exhibiting three results, which show the action which alcohol and quick-lime, exercise upon each other.

1. On passing absolute alcohol upon quick-lime, heated to the temperature of 220 degrees, the alcohol underwent no change; the lime did not retain even a trace of it.

2d. If absolute alcohol be left with hydrate of lime, (Ca,Aq,) for several days, and the hydrate be then dried at the temperature of 35° or 40° , it does not retain the smallest quantity of alcohol.

3d. If absolute alcohol, be distilled with slacked lime (pure hydrate Ca,Aq,) the alcohol carries off a part of the water of the hydrate. In one experiment, 0.5 pound of absolute alcohol, distilled on a salt water bath, after forty-eight hours of contact with 324 grammes of hydrate of lime, furnished 0.49 pound at 93.6 .

In the rectification of alcohol by lime, it is always necessary to leave the two bodies in contact for one or two days, as it is only by degrees that the alcohol yields its water to the lime. The heat of a stove of 35° to 40° is very favorable.

One pound of alcohol of 93 was left for two days upon 220 grammes of quick-lime in powder; at the end of that time a small quantity of the alcohol, on being filtered, marked 95.8° . It was then distilled from the lime, and furnished 0.75 pound of alcohol, of 95.8° . The alcohol had, therefore, lost water, and the lime had retained water and alcohol.

A pound of alcohol, of 91° , was left in contact with 500

grammes of powdered quick-lime, for forty-eight hours; the alcohol marked then, previous to distillation, 95.9° . I then added to the mixture 500 grammes of quick-lime; twenty-four hours after, the whole was reduced to a thick paste. I separated a little of the alcohol by the filter; it marked 99.2° . I now repeated the experiments, only placing the whole of the lime at once in the alcohol. This was again raised to 99.2° . It results from these two experiments that the lime, when employed in sufficient quantities, can, in the cold, deprive the alcohol of nearly the whole of its water. If this paste of lime be placed in an alembic, upon a salt water bath, and distilled, then nearly the whole of the alcohol which passes over is absolute alcohol.

Five pounds of alcohol of 94.5° was left for three days, at the temperature of 15° c., with 2500 grammes of lime; the alcohol was filtered and marked 95.5. The mixture was then placed in a stove, at the temperature of 35 to 40° , at the end of twenty-four hours, the alcohol marked 99.5° . It was left for twenty-four hours more in the stove, and the degree of the alcohol did not alter; then the mixture was slowly distilled on a salt water bath. The first portion of the alcohol which passed over, marked 99.5° . All which followed was absolute alcohol. Nevertheless, towards the termination of the operation, when the distillation appeared almost finished, the water being kept in the state of ebullition in the cucurbit, there passed a small portion of alcohol of which the degree was constantly lowering. The last liquor obtained marked only 97° . This result I have constantly noticed in rectifying alcohol by lime; the first portions which pass over contain traces of water; but this is soon replaced by absolute alcohol, which in its turn, towards the end of the operation, is succeeded by aqueous alcohol; from which it is evident that part of the hydrate of lime is decomposed.

In all the distillations of alcohol with lime, I experienced a loss of alcohol which was so great, when I wished to operate on considerable masses, that I soon deserted this mode. I think that this loss is owing to the heat being propagated with in-
effi-

culty to the middle of the mass of lime, which we are obliged to use. The experiments which I have related do not leave room for the belief that the alcohol combines with the hydrate of lime, of this I am fully convinced by the following experiment:

A pound of alcohol of 84° , which contained 0.800 pound of absolute alcohol, was put into an alembic with 500 grammes of finely powdered quick-lime, and then distilled by a salt water bath; the first portions marked 99.0° ; then the degree was elevated; I obtained absolute alcohol, and finally, towards the end of the operation, alcohol of a weaker grade. The water in the cucurbit was kept boiling for more than two hours after that the alcohol had ceased to come over more than drop by drop. All the products collected and united, weighed 94° . Their volume was 0.88 of a pound, which contained 0.827 of absolute alcohol.

I next employed carbonate of potassa, of which the use is recommended by some pharmacopœias, but of which the effects have been imperfectly studied.

I left, at a temperature of about 15° , 500 grammes of calcined carbonate of potassa, to act upon five pounds of alcohol of 86° . The carbonate of potassa slowly liquified. The alcohol, which at first had dissolved a portion of the alkali, deposited it as the rectification advanced. Distilled from the alkaline salt, it furnished alcohol of 94° .

Analogous experiments have afforded me similar results. The last experiment was made on 200 pounds of alcohol of 86° . I obtained nearly the whole of the alcohol of 93.3. The last products marked 91° .

I was desirous of knowing how far the alkaline carbonate would carry the rectification. For this purpose, I used 225 grammes of carbonate of potassa, for a pound of alcohol of 86° . I obtained 94.6° . I used 200 grammes of the salt for a pound of alcohol already at 94.6° ; after many hours of contact, distillation furnished 94.8° ; the product returned to the same vessel and distilled anew marked 95.4 .

In another experiment, in which I employed 1.500 grammes of the salt, and three pounds of alcohol of 93.4° , the product

marked 94.7. Thus this limit of 94 to 95 appears to be impassable; at this point, the affinities of the alcohol and of the alkaline salt for the water, counterbalance each other. It is but step by step that the water is separated, and we can no longer hope for advantageous results from the use of the alkaline carbonate. It is to be remarked that, at this point, the the alcohol is very near to the proportions of three atoms of alcohol and one of water, which constitutes alcohol of 95.1°.

However, the carbonate of potassa, is the most convenient agent which we can employ in the first rectification of alcohol; it brings it, without loss or difficulty, to 94 or 95°. The salt, after the operation, can be readily made useful; besides which, as it is scarcely soluble, it has not, like the caustic alkali, the disadvantage of altering the sweetness of the product.

Alcohol of 94° being obtained, how shall we deprive it entirely of the water which it contains?

100 grammes of fused chloride of calcium easily raises it to 97°, but with a considerable loss of alcohol; on adding to alcohol at 94°, 150 grammes of quick-lime to the pound, it will be raised, by remaining several days in a stove, to 97°. It is proper, in this case, to decant the alcohol, and not distil from the deposit, for it will then lose strength. The deposit may then be distilled alone, and will afford a feeble product.

Now, this alcohol of 97°, obtained by chloride of lime, or by quick-lime, being slowly distilled with 250 grammes of quick-lime to the pound, after two or three days of rest in the stove, will readily yield absolute alcohol.

I afterwards attempted to act with quick-lime directly upon the alcohol of 94°, obtained by the alkaline carbonate. The following first experiment is curious from its result:

Five pounds of alcohol of 94 were placed in a flask in a stove, with one killogramme of quick-lime, recently calcined and pulverized; the alcohol swimming over the lime at the end of two days, marked 99°.

The lime and alcohol were then distilled together slowly, and there was obtained successive portions of alcohol of 97.5°, 97.3°, 97.4°, 97.5°, 97.4°, 97.6°, 97.8°, 98.1°, 98.2°, 98.1°,

97.2°, 96.6°. Thus the alcohol has lost strength by distillation from the lime; it is the consequence of the fact which I before announced, that absolute alcohol became weaker by distillation from hydrate of lime. We observe this fact, wherever the lime is not in sufficient excess, one part of the hydrate of lime formed yields its water to the alcohol during distillation.

It is, therefore, necessary to use 500 grammes of lime to the pound of alcohol; and if the distillation be then slowly carried on, we readily obtain absolute alcohol. We may push the distillation as long as alcohol comes over; but the last portions are so long in passing that we would rather prefer, as soon as the alcohol ceases to flow in a stream, to add water to the lime, and draw off what remains as dilute alcohol.

To sum up, if we wish to obtain readily, abundantly, and economically, absolute alcohol, it is necessary to rectify first upon carbonate of potassa, then to rectify the alcohol which marks 94 to 95 by one of the two following methods:

1. To raise it to 97° by distillation with 100 grammes of fused chloride of calcium, or by letting it digest upon 150 grammes of quick-lime to the pound, and distilling anew and slowly with 250 grammes of quick-lime to the pound, after that the alcohol and lime have been in contact for two or three days in a warm place.

2. To add to the alcohol of 94°, 500 grammes of quick-lime to the pound; to leave them in contact for two or three days in a stove, and distil slowly. We will be much deceived if we suppose that the lime will communicate to the alcohol a disagreeable odor, or taste, as is stated in some works; this only happens when the alcohol upon which the lime is caused to act, has not been previously rectified; but after it has been submitted to rectification from the alkaline carbonate, this effect is not to be feared, and the alcohol which we obtain has all the qualities which we can desire.

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ART. XLII.—ON DIAPHORETIC ANTIMONY.*

By OSCAR FIGUIER.

THIS preparation is most generally known, in the shops, by the name of white oxide of antimony, and is extensively employed by practitioners. It is the compound which the French Codex, of 1818, designates by the name of *oxidum stibii album mediante nitro confectum*.

All pharmacologists are far from according in the mode of preparing this medicine, and one of the most unfortunate effects of this disagreement is, that the products obtained by the different methods do not present similarity in their composition and properties.

It results from the experiments of M. Berzelius, on this subject, that when a large excess of nitre is not employed, the product contains, in a state of mixture, differently oxydised compounds of antimony. M. Soubeiran has admitted that such is the composition of diaphoretic antimony, obtained by equal quantities of nitre and antimony, according to the Codex of 1818.†

* This paper is an extract from a monograph upon the substances designated under the name of white oxide of antimony, which obtained the gold medal of the Royal Society of Medicine, Surgery, and Pharmacy, of Toulouse.

† The following are the directions taken from the revised Codex of 1837.

SUPER ANTIMONIATE OF POTASSA.

(Antimonie Diaphoretique lavée.)

SUPER STIBIAS POTASSICUS.

R.	Pure Antimony, (<i>Stibium purum</i> ,)	1000
	Nitrate of Potassa, (<i>Nitras potassicus</i> ,)	2000

Reduce each of these bodies to a fine powder, and mix intimately. Throw the mixture by small portions at a time into a crucible, previously heated to redness. When it is almost full, fit on the cover, and continue the heat for about half an hour. Then remove the contained pasty matter, allow it to cool, place it in a stoneware pan, and pour upon it a sufficient quantity of clear water. Allow the substance to break up of itself, then agitate with a wooden ladle, wash by decantation until the water no

Our experiments have led to the confirmation of this result. It is known how great is the difficulty of separating the different oxides of antimony; it is so great, that the most experienced analysts of our age regard it as almost insurmountable.

The following is the method we have followed in endeavoring to arrive at this end.

Diaphoretic antimony was treated several times in succession by acetic acid, at first weak, then more and more concentrated. This acid removed the potassa, and the protoxide of antimony; the latter was converted into an insoluble sulphuret, by means of sulphuretted hydrogen, and the quantity of sulphuret gave the proportion of oxide contained in the mixture.

To know the proportions of antimonious and antimonie acids, we dried the mixture of these two oxides, freed from the protoxide, at a temperature of 100° . The product thus dried, was introduced into a tube of green glass, provided with a leaf of copper, such as is employed for the elementary analysis of organic substances. To this was adapted a second tube, of dry chloride of calcium, as is practised in these analyses. Both tubes were exactly weighed. Heat was applied with caution, and continued at a dull red for an hour. The oxygen disengaged itself, with the water, at the commencement of the operation, but at its termination oxygen alone was disengaged. The heat was continued some time, until after bubbles ceased to form. The apparatus having been cooled, the two tubes were weighed. The increase in weight of that containing chloride of calcium, gave the quantity of water. The diminution in weight of the tube containing the oxides, indicated both the loss in water and oxygen. The quantity of water being known, it was easy to deduce the quantity of oxygen, which represented that which the antimonie acid had lost by its conversion into antimonious acid.

longer has a perceptible taste; finally throw the deposit upon a linen cloth, and dry by a stove.

Diaphoretic antimony should be of a perfect white color; it is composed of antimonie acid 87.75, potassa 12.25.

J. C.

These data are sufficient to establish the true constitution of the mixture.

We have practised this analytic method upon several specimens of diaphoretic antimony, obtained by different operations, where we have taken the greatest precaution to have the products identical: viz., equal proportions of the ingredients, the same vessel, the same continued heat, and in spite of these precautions we have obtained variable proportions of the different oxides.

The following table indicates to a hundredth nearly the respective quantities of oxides, acid, and water, which we have found contained in four equal weights of diaphoretic antimony prepared according to the Codex of 1818:

Oxide of Antimony	2.31	1.79	3.22	9.85
Antimonious Acid	8.31	9.36	7.39	13.21
Antimonic Acid	79.14	79.60	98.44	66.67
Water	10.24	9.25	10.95	10.27

Thus it is proved by us, that by following the Codex of 1818 to prepare diaphoretic antimony, it is almost impossible to obtain a product constantly identical; it is always a mixture, in variable proportions, of hypo-antimonite, of antimonite, and of bi-antimoniate of potassa, and of water. A few degrees of heat are influential in varying the relative proportions of these three compounds, which we have constantly found. We ought to state, however, that by maintaining the heat at the point of redness for an hour and a half, we have ascertained that the hypo-antimonite had completely disappeared.

Let us examine the product obtained by following exactly the directions given by the new Codex.

M. Guibourt, professor in the school of Pharmacy of Paris, has devoted himself to researches upon this subject; the results to which we have come, are nearly those published by that skilful observer, but they differ from them in some respects; thus, according to M. Guibourt, diaphoretic antimony, prepared according to the new Codex, is composed of

		Result obtained.	Result calculated.
Antimonic Acid	2 at	76.73	76.964
Potassa	1 “	10.97	10.744
Water	6 “	12.30	12.292

M. Guibourt does not admit that the diaphoretic antimony of the Codex can be a variable mixture of different oxides of this metal. The following experiments tend to show the opposite conclusion:

We treated by strong acetic acid the article of the Codex, prepared by following exactly the directions of that formulary. This acid dissolved a small quantity of the protoxide of antimony, which can easily be known, after its separation by means of the action of alkaline sulphurets, according to the observation of Berzelius.* The product, deprived by successive maceration with acetic acid of potassa and protoxide of antimony, was dried. We obtained 4.50 grammes. We placed them in a tube of green glass, to which was adapted a second tube, containing chloride of calcium equally weighed. The tube of green glass was maintained for an hour, at a dull red heat; it lost in weight 0.408 grammes. The tube of chloride of calcium was increased 0.228.

If we had had to make pure antimonic acid, the quantity of water would have nearly equalled the loss given by experiment; but the loss, in oxygen should have been 0.220, in fact, it was only 0.180. This difference arises necessarily, in consequence of a part of the product, supposed to be in the form of antimonic acid, being really in the state of antimonious acid.

The above demonstrate that washed diaphoretic antimony, obtained with two parts of nitre, is a mixture of differently oxydized portions of antimony combined with water and potassa.

In order to obtain diaphoretic antimony, entirely formed of the antimoniate of potassa, it is necessary to take of metallic antimony, carefully purified by the process of Liebig, one part,

* Ann. Ch. et Phys. t. xx, p. 237.

nitrate of potassa, three parts, as directed by the Brunswick Dispensatory; the materials are reduced to powder, they are mixed exactly, and thrown by portions into a crucible, previously heated to redness. The matter is maintained at a red heat, during an hour and a half when cold; the product is thrown into four parts of water, decanted, and the liquid placed aside. The residue is three times to be boiled with the same quantity of water; the liquids are mixed, and the washing is finished by boiling water, which only removes the slightest traces of antimoniate. The product thus washed, is impure bi-antimoniate, but free from hypo-antimonite. If through the washing liquids a current of carbonic acid gas be passed, a very abundant precipitate is obtained, which is pure bi-antimoniate. As the carbonic acid can only separate a part of the potassa, the precipitate is necessarily formed of bi-antimoniate.

M. Berzelius remarks, that in the preparation of diaphoretic antimony, if the calcination be prolonged, the hypo-antimonite and the antimonite of potassa, are transformed into a neutral soluble antimoniate: the waters of washing, then, which are obtained, ought to furnish the greatest possible quantity of precipitate; which is the same as saying, that if we wish to employ the product of which we have spoken, it is necessary to prolong the calcination as much as possible, (during an hour and a half, or nearly,) to reject the insoluble product, after it has been well washed, and to preserve only the precipitate by the waters of washing, furnished by carbonic acid. The reiterated experiments which we have made upon this subject, have proved to us that, by this means, we can obtain more than three-fourths of the mixture employed.

If now we consider that heretofore the washings were rejected as valueless, it can be admitted that our method, independently of the goodness of the product, furnishes also a large enough quantity.

The antimoniate thus obtained is of perfect whiteness. We have analysed it by heating it to a red heat in a platina crucible, then by calcining another part in a tube, and receiving

the vapor of water in a tube with chloride of calcium, we have found the composition the same as that assigned to it by M. Guibourt.

We have tried to substitute for the carbonic acid the strong acetic acid, employed in very slight excess; the precipitate in this case has been antimonious acid, containing only some traces of antimoniate of potassa.

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ART. XLIII.—NOTICE OF THE ALCOHOLIC STRENGTH
OF WINES. By DR. CHRISTISON.

VARIOUS accounts have been given of the alcoholic strength of wines, by Brande, Julia-Fontenelle, and others. The author has been engaged for some time, in experiments for determining the proportion of alcohol, contained in various wines of commerce, and also, the circumstances which occasion a variety in this respect. The present paper, is an interim notice of the result.

The method of analysis consisted in the mode of distillation, which was applied with such contrivances for accuracy, that nearly the whole spirit and water were distilled over without the loss of more than between two and six grains in 2000. From the quantity and density of the spirit, the *weight* of absolute alcohol, of the density of 793.9, as well as the *volume* of proof spirit of the density of 920, was calculated from the tables of Richter, founded on those of Gilpin.

The author has been led to the general conclusion, that the alcoholic strength of many wines has been overrated by some experimentalists, and gives the following table as the result of the investigations he has hitherto conducted. The first column is the per centage of absolute alcohol, by weight, in the wine; the second, the per centage of proof spirit by volume.

	Alc. p. c. by weight.	P. Sp. p. c. by volume.
White Port,	14.97	31.31
Sherry, weakest,	13.98	30.84
Mean of thirteen wines, excluding those kept very long in cask,	15.37	33.59
Sherry, strongest,	16.17	35.12
Mean of nine wines very long kept in cask in the East Indies,	14.72	32.30
Madre da Xeres,	16.90	37.06
Madeira, { all long in cask } strongest,	14.09	30.80
{ in East Indies, } weakest,	16.90	36.81
Teneriffe, long in cask at Calcutta,	13.84	30.21
Cercial,	15.45	33.65
Dry Lisbon,	16.14	34.71
Shiraz,	12.95	28.30
Amontillad,	12.63	27.60
Claret, a first growth of 1811,	7.72	16.95
Chateau-Latour, first growth of 1825,	7.78	17.06
Rosan, second growth of 1825,	7.61	16.74
Ordinary Claret, a superior vin ordinaire,	8.99	18.96
Rives Altes,	9.31	22.35
Malmsey,	12.86	28.37
Rudesheimer, superior quality,	8.40	18.14
Rudesheimer, inferior quality,	6.90	15.19
Hambacher, superior quality,	7.35	16.15
Giles' Edinburg Ale before bottling,	5.70	12.60
The same Ale two years in bottle,	6.06	13.40
Superior London Porter four months bottled,	5.36	11.91

In addition to certain obvious conclusions which may be drawn from this table, the author stated, as the result of his experiments, that the alcoholic strength of various samples of the same kind, bears no relation whatever to their commercial value; and is often very different from what would be indicated by the taste of an experienced wine taster.

Some observations were next made on the effect produced on the alcoholic strength of wines, by certain modes of keep-

ing or ripening them, more especially by the method employed in the case of sherry, madeira, and such other wines, which consists of slow evaporation, for a series of years, through the cask, above, all in hot climates. The researches made by the author on this head are not complete; but he is inclined to infer from the experiments already made, that, for a moderate term of years, the proportion of alcohol increases in wine, but afterwards, on the contrary, diminishes; and that the period when the wine begins to lose its alcoholic strength is probably that at which it ceases to improve in flavor. The increase which takes place at first in the alcohol of wine undergoing evaporation through the cask, appeared at first view parallel to the fact generally admitted on the authority of Söemering, that spirit becomes stronger when confined in a bladder, or in a vessel covered with a bladder, in consequence of the water passing out by elective exosmose.

The author, however, on repeating the experiments of Söemering, as related by various writers, (for he could not obtain access to the original account of them,) was unable, by any variation of the process he could devise, to obtain the results indicated by the German anatomist. Constantly the spirit, whatsoever its strength, whether proof spirit or rectified spirit, became weaker. It was observed at the same time, that if the bladder containing spirit was enclosed in a confined space containing quick-lime, the spirit slowly became absolute alcohol of the density of 796, in consequence of a permanent atmosphere of alcohol being speedily formed, while the watery atmosphere was absorbed by the quick-lime as fast as it was produced. Subsequently it was proved that the bladder was not essential to the process; for an open cup of rectified spirit enclosed in a confined space with quick-lime, to absorb the water which arose from the spirit, became in two months absolute alcohol, of the density of 796. Professor Graham, of London, some time ago proved the analogous fact, that spirit might be thus rendered pure alcohol in the vacuum of an air pump. A vacuum, however, is, upon principle as well as fact, not necessary to the process; it merely accelerates it.

The new method is obviously applicable on the great scale for obtaining absolute alcohol, whenever time may be allowed.—*Proceedings of the Royal Soc. of Edin.—Lond. and Edin. Phil. Journ.*

ART. XLIV.—OBSERVATIONS ON ANTIMONY.

By H. CAPITAINE.

ANTIMONY fuses under a red heat, but is more or less fusible according to its purity. Chemically pure, as when extracted from tartar emetic, which is perfectly white and well crystallized, it is more fusible than the antimony of commerce, alloyed, as is well known, by different metals, and even than the antimony purified by the process of the Codex, or by that recommended of late by M. Liebig.

When antimony is heated by the blow-pipe on charcoal, it fuses into a perfect globule, which preserves, after cooling, a metallic brilliancy similar to that of silver. If the experiment be made with any of the three kinds of antimony cited above, a globule is obtained, which, after cooling, does not preserve its brilliancy in so perfect a manner. It has always a tarnished appearance; the globule from the antimony of commerce becoming completely black.

I may state here that the granular state, and the crystallization in small plates, which the Codex and many chemical works regard as a sign of the purity of antimony, constitutes a character of but little value; for we can cause antimony to assume either appearance, without undergoing any purification. It is only necessary for this, to fuse the metal and cause it to cool suddenly, or with slowness. When the cooling is very prompt, the antimony has a granular texture; when it takes place more slowly, it crystallizes in small plates. That pure antimony commonly exhibits a granular texture, or small plates, is solely due to the circumstance that we always ope-

rate on small quantities, and the metal cools too rapidly to assume the texture of large plates, such as the antimony of commerce presents.

Antimony entirely devoid of arsenic, when thrown on incandescent coals, gives off vapors which are entirely without odor. However small may be the alloy of arsenic, the vapor still assumes the alliaceous odor. This method is perhaps the most delicate for recognising the presence of arsenic in antimony. The process proposed by M. Serullas, and adopted by the authors of the new Codex, is likewise of great sensibility; but the process of Marsh, which is so sensible when searching for arsenic in a free state, or in combination with oxygen, is totally insensible when the object is to detect arsenic in metallic antimony.

In fact, if we introduce into the apparatus of Marsh, antimony of commerce containing arsenic, and giving rise to a strong alliaceous odor on burning coals, dull black metallic spots will be obtained, which, although they may contain more arsenic than the antimony from which they were derived, will react with agents absolutely as if entirely of pure antimony. Formed on plate of porcelain, and treated by one or two drops of nitric acid, they furnish, after the excess of acid has been driven off by heat, a residue which, touched by nitrate of silver, produces no red color which indicates the presence of arsenic; but if, after treatment with the nitrate of silver, we add to the residue a drop of ammonia, in an instant there is formed a beautiful black color, which M. Orfila states to be a character peculiar to antimony, and very suitable to distinguish it from arsenic.

Thus the arsenic which exists in the spots which are obtained by placing in the apparatus of Marsh, arsenical antimony, is concealed, and is not to be detected by those means which are useful when it is isolated. This is owing to the circumstance, that when arsenical antimony is treated by nitric acid, the arsenious or arsenic acid which is formed by the oxidation of the arsenic, does not remain in a free state; it combines with the antimonious acid, and is thus withdrawn

from the influence of the reagents. The quantity of arsenic which may be thus hidden in the antimony, without its existence being suspected or discovered, except by the means which I shall point out, is considerable. Antimony which I had alloyed with $\frac{1}{30}$ of arsenic acted like the antimony of commerce, notwithstanding which the product from the action of nitric acid, when thrown upon burning coals, gave out a strong alliaceous odor.

Antimony may combine with hydrogen, but I have never been able to produce this compound except mixed with considerable free hydrogen gas.

Antimoniuretted hydrogen has no odor, in which it differs from arseniuretted hydrogen; it is besides remarkable for the facility with which it is decomposed; under an elevation of temperature it is separated into its simple elements and this much before the temperature is carried to a red heat.

Arsenic, especially when it finds nascent hydrogen, unites with it, and produces arseniuretted hydrogen. It is not the same with antimony: an alloy of potassium and antimony, thrown upon water, yields perfectly pure hydrogen; but should the alloy contain even traces of arsenic, the gas will have the characteristic odor of arseniuretted hydrogen, and will deposit a black coating when burnt in a narrow tube.

That antimoniuretted hydrogen should be produced, it is necessary to place in water, strongly acidulated with sulphuric acid, an alloy of antimony and zinc. The disengaged gas contains antimoniuretted hydrogen, together with much free hydrogen. An alloy of two parts of zinc and one part of antimony is that which furnishes a product the least mixed with free hydrogen, especially if a quantity of oxide of antimony be added to the liquid. When an alloy of one part of zinc and one of antimony is used, the action is very slow, and the gas disengaged is hydrogen nearly pure.

The combinations of antimony and oxygen have not the absolute insolubility in oxygen which is usually attributed to them. I have ascertained that oxide of antimony, antimonious

and antimonie acids, are slightly soluble in water, more especially at the boiling temperature.

The solution of oxide of antimony does not deposit any thing on cooling. It reacts with sulphuretted hydrogen absolutely, like a feeble solution of arsenious acid; it becomes of a clear yellow color, and if ammonia be then added, the color disappears, the solution being entirely colorless. The sulphuret of antimony formed in this instance, dissolves in the ammonia with the same facility as the sulphuret of arsenic. When I first noticed this property, I suspected it to happen from having used antimony containing arsenious acid, although I had used the process, recommended by M. Liebig, to obtain the purified antimony which I had employed. But having boiled the residual oxide in several successive portions of water, I obtained, each time, a liquid which produced, with sulphuretted hydrogen, a yellow color of similar intensity.

The constant reproduction of this color, sufficed to attribute it to the oxide of antimony, and not to arsenious acid. I nevertheless repeated the experiment with pure oxide of antimony, extracted from tartar emetic, and of the purity of which I could have no doubt; the same appearances were reproduced. There is, therefore, an identity in the manner in which a weak solution of arsenious acid, and a solution of oxide of antimony react, when treated by sulphuretted hydrogen and ammonia; but, although similar in certain characters, they differ much in others. While that of the solution of arsenious acid, in the apparatus of Marsh, gives brilliant metallic spots, the solution of oxide of antimony, submitted to the same test, furnishes black, tarnished spots, offering all the characters of antimony.

The yellow liquid, obtained by causing sulphuretted hydrogen to act upon a weak solution of arsenious acid, left to itself, deposits a canary-yellow powder, (sulphuret of arsenic;) the yellow liquid, from oxide of antimony, will deposit, by the next day, orange-yellow flocculi, easily recognised as sulphuret of antimony. The sulphuret of antimony is separated, imme-

diately, from the solution by the addition of concentrated hydrochloric acid, especially when boiling.

Antimonious acid is more soluble in water than the oxide; the filtered boiling liquor becomes cloudy on cooling; it is colored yellow by sulphuretted hydrogen, and is deprived of its color by ammonia, as entirely as the solution of the oxide.

When antimonious acid is heated with iodide of potassium in a tube, closed at one end, abundant vapors of iodine are disengaged, and the residue is an hypo-antimonite of potassa. The temperature need not be much increased to produce this effect.

The antimonie acid has also a slight solubility in water, and its solution acts with sulphuretted hydrogen and ammonia in the same way as the oxide of antimony and antimonious acid.

The hydrated sulphuret of antimony, which is formed by the action of sulphuretted hydrogen on protoxide of antimony dissolved in water, exhibits, both while in suspension and solution, the clear yellow color of sulphuret of arsenic; besides, like the former, it is soluble in ammonia; whether this be added to the clear and transparent liquor, or to the sulphuret itself when deposited as orange yellow flocculi.

I am satisfied that the sulphuret of antimony is really dissolved in the ammonia itself, and not in the sulphuret of this base, which is produced by its addition to a liquid containing more sulphuretted hydrogen than is necessary for the decomposition of the oxide of antimony. For when we add to the solution of oxide two or three drops of water of sulphuretted hydrogen, certainly not sufficient to destroy all the oxide, the yellow color will be discharged by ammonia, the same as if the liquid had contained an excess of sulphuretted hydrogen. Besides, if, after having decomposed the oxide by a slight excess of the sulphuretted hydrogen, the solution be then boiled for a short time, the orange yellow sulphuret, which is deposited, is, when separated from supernatant liquid, completely soluble in ammonia.

The sulphuret of antimony, formed by the action of sulphuretted hydrogen on oxide of antimony, possesses, like the

sulphuret of arsenic, an unequivocal solubility in ammonia. It is the same with the sulphuret of antimony obtained by the action of sulphuretted hydrogen on oxide of antimony, in combination; but here the solubility is not so great as appearances would lead us to believe.

When a small quantity of sulphuretted hydrogen water is added to a solution of tartar emetic, a yellow color is produced which ammonia will not discharge. If a large quantity of the sulphuretted hydrogen be added, an orange colored precipitate is formed, and readily deposited as long as the sulphuretted hydrogen is not in excess; but, if the addition be continued, the greater part of the sulphuret of antimony will be very slowly deposited and remain as if in suspension in the liquid. If the ammonia be added to the supernatant liquor, it will instantaneously render it clear and transparent; but here it is not the ammonia alone which dissolves the sulphuret, but it is the hydrosulphuret of ammonia, resulting from the union of the ammonia with the excess of the sulphuretted hydrogen.

If the sulphuretted hydrogen, which is deposited, be washed several times in water, and then placed in ammonia, it dissolves in a notable quantity. The ammonia does not change color, but when exposed to the air, or saturated by an acid, it deposits the sulphuret which it held in solution.

The bi-sulphuret is soluble in ammonia, and the solution is yellow.

The per-sulphuret dissolves largely in ammonia, and the solution is likewise yellow. Exposed to heat it is decomposed into sulphur, and sulphuret of antimony. We do not know whether this sulphuret should be considered as a particular combination, or whether it is a mixture of sulphur with bi-sulphuret of antimony.

Jour. de Pharm.

ART. XLV.—ON THE HYPOCHLORITES. BY M. E. MILLON.

(Extract.)

It is generally admitted that the decolorizing compounds, produced by the direct action of chlorine on the alkalies, are mixtures of metallic chlorides and salts, formed by a particular acid, the hypochlorous acid. "This hypothesis," says M. Millon, "appears to be entirely established by the discovery made by M. Balard, of the existence of a peculiar compound of chlorine and oxygen, formed of a single equivalent of each element; but, on examining the action of these supposed mixtures of chlorine and hypochlorites upon salts of a lower grade, we discover a series of new facts, which are inexplicable by the theory of the hypochlorites, and which leads to a new and unexpected mode of viewing the bleaching compounds.

"If a recent solution of chloride of lime be caused to act upon a solution of nitrate of lead, a precipitate is obtained, which is at first white, but soon becomes yellow, and, by gradually deepening its shades, changes to a brown. The supernatant liquor contains nothing but nitrate of lime. The white precipitate has been considered as a chloride of lead, which, by a subsequent decomposition of the hypochlorite, is converted into peroxide of lead; but if this white precipitate be separated immediately after its formation, there will be no difficulty in discerning that it does not possess the properties of chloride of lead. It continues to become colored, notwithstanding the absence of the hypochlorite of lime, at a slightly elevated temperature, and analysis demonstrates that the precipitate, in its white and brown state, are isomeric conditions of the same body, of which the formula is PbOCl . It is a compound which corresponds to the peroxide of lead, and in which the oxygen, which constitutes this latter a peroxide, is replaced by an equivalent of chlorine. This same compound is likewise formed whenever a current of dry chlorine is caused to pass upon litharge, obtained by calcining carbonate of lead. On substituting the protonitrate of iron for the ni-

trate of lead, there is thrown down a brown substance, having all the exterior properties of peroxide of iron, but which is represented by the formula $\text{Fe}^2\text{O}^2\text{Cl}$; it is again the peroxide in which all the oxygen constituting the higher degree of oxydizement is replaced by its equivalent of chlorine. With the protosalts of manganese an analogous precipitate is produced, but the quantity of chlorine is doubled. If the persalts of iron and manganese be employed, instead of the protosalts, a subsalt is deposited, and chlorine is disengaged in abundance. With the salts of deutoxide of copper the phenomena take place differently. A compound is formed, and which decomposes almost immediately at common temperatures, and liberates pure oxygen. At the same time that the oxygen is disengaged, an oxychloride of copper is deposited, of which the formula is Cu^2OCl , and which thus corresponds to the deutoxide. The same compound is formed directly, by passing dry chlorine upon protoxide of copper, slightly heated by the flame of an alcohol lamp."

"It is very easy," says M. Millon, "to generalise these facts, and consider the bleaching compounds, formed by the alkalies, as compounds corresponding to the peroxides, but in which an equivalent amount of chlorine has been substituted for that portion of the oxygen which constitutes the peroxide. Then in these two orders of compounds, an analogy in composition would lead to an analogy in properties; the same want of permanency, the same oxydizing power, the same decolorising action, for the alkaline peroxides exhibit great energy in bleaching.

"This new theory should find its verification in the comparative composition of the bleaching compounds of soda and potassa. The two peroxides of these bases have a very different composition. That of potassium is KO^3 , that of sodium, which is not given by Thenard, but is represented in the tables of Berzelius, by Na^2O^3 . It results from these two formulas that the bleaching compound of potassa should contain four times as much chlorine as that of soda.

$\text{K}\text{aO} + \text{O}^2$ peroxide of potassium corresponds to $\text{K}\text{aO} + \text{Cl}^2$.

$\text{Na}^2\text{O}^2 + \text{O}$ peroxide of sodium corresponds to $\text{Na}^2\text{O}^2 + \text{Cl}$.

“Experience proves that potassa absorbs a quantity of chlorine double that which soda absorbs. Potassa should absorb four times as much; there is then an error in the theory or in the formula assigned to the peroxide of sodium. An analysis of this latter was then made, and it was, in fact, found that in the formula adopted, the oxygen had been stated too low, that the sodium united with two atoms of oxygen in place of one and a half, to become peroxide, and should be represented by NaO^2 . The potassa compound ought then, as is proved by experiment, to have double the decolorizing power of that of soda. The theory thus is found to be confirmed.

“The bleaching compounds,” pursues the author, “do not then constitute salts, but rather combinations corresponding to the peroxides, in which all the oxygen, which is added to the protoxide to form a higher oxide, is replaced by its equivalent of chlorine, and, by a singular turn of theory, the compounds, considered as mixtures of chlorides and hypochlorites, are really simple compounds; while the hypochlorites, considered as simple salts, and without mixture, are mixtures of peroxides and peculiar bodies corresponding to peroxides.

“It is natural to presume that bromine, iodine, sulphur, and, perhaps, other metalloids, form analogous compounds, and on the other hand, that compounds of that nature which are formed by chlorine, and correspond to the higher oxides not suitable to form salts, as the peroxides of lead and bismuth, give rise, with hydrochloric acid, when the reaction takes place under the influence of a freezing mixture, to a new bleaching compound, formed of chlorine and hydrogen, which contains twice as much chlorine as hydrochloric acid. It is a bichloride of hydrogen, which, in the series of combinations of chlorine, is altogether analogous to the peroxide of hydrogen. Oxygenated water, therefore, promised to become the type of numerous and parallel series which will expand considerably the field of mineral chemistry, without introducing any complication.

P. A. C.

Journ. de Pharm.

ART. XLVI.—ON CINCHONA. Extracted from the Lectures of

JOHN PEREIRA, Esq., F. L. S.

Published in the London Medical Gazette.

(Concluded.)

(a.) *Pale Barks (Cinchona pallida.)*1. *Crown or Loxa Bark.*

History and synonymes.—A bark called *Loxa bark* has been long known in Europe, and was perhaps one of the first introduced into this quarter of the world. In all probability it was the bark which Horbius, in 1693, denominated *Cascarilla della Oja*, but which Condamine more correctly terms *Corteza*, or *Cascara de Loxa*. It is admitted, I believe, by all botanists, that this bark was procured from the *Cinchona condaminea*; but some doubt exists in the minds of pharmacologists whether this is the bark now known in commerce by the name of *Loxa bark*. Hayne has pointed out some differences between the *Loxa bark* of commerce and a bark found in Humboldt's collection, marked *Quina de Loxa*, and which had been collected from the *C. condaminea*: the peculiar characteristics of the latter are the warty prominences, the transverse cracks, which do not form rings, the browner tint of the outer surface, and a more astringent taste. A representation of this kind of bark is given in Goebel and Kunze's "*Pharmaceutische Waarenkunde*:" and the first of these authors tells us, that in a chest of 120 pounds of commercial *Loxa bark*, he could only find three ounces corresponding to this true *Loxa bark*. Bergen does not admit the opinion of its being a distinct kind.

Loxa bark received the name of *Crown bark (Cinchona corona seu coronalis)* in consequence of its use by the royal family of Spain. The following anecdote will serve to illustrate this point:—In October, 1804, a Spanish galley, returning from Peru, was taken by our countrymen off Cadiz. Among the treasures found therein were many parcels of *Cinchona bark*, two sorts of which were distinguished from

the others by their external appearance and mode of packing. Two of these chests were marked "*Para la real familie*," (for the royal family,) and were lined with sheet iron: they contained fine quills, of thirteen inches long, tied up by means of *bass* into bundles of about three inches in diameter. Von Bergen states that he received from England, in 1824, similar bundles, under the name of *second Crown*. The other sort was marked "*Para la real corte*," (for the royal court.)

Commerce.—Crown or Loxa bark is imported in serons (holding from sixty to ninety pounds,) and in chests (containing about one hundred pounds.) In these packages we sometimes meet with bundles tied round with *bass*. A bundle which I have is fourteen inches long, and six inches in diameter.

Varieties.—Druggists make several varieties of Crown bark, but none of them of much importance: they are founded partly on the thickness and size of the quills, and the nature of the epidermis,—partly on the crustaceous lichens. Thus the finest and thinnest quills, with a short fracture, constitute what is called *Cort. Cinchonæ coronæ superf. elect.* A somewhat larger quill, with a silvery appearance of the epidermis, derived from the adherent crustaceous lichens, constitutes the *Silver Crown bark*. A similar kind of bark, but in which the external coat has a speckled appearance, is called *Leopard Crown bark*. Lastly, a rusty colored variety, remarkably free from lichens, and which I believe to be the young Huamalies bark, is sold as *Rusty Crown bark*.

Characters.—Loxa or Crown bark is only met with in the form of coated quills; neither flat nor uncoated pieces being ever met with. These quills vary in length from six to fifteen inches; in diameter from two lines to an inch; in thickness from one-third of a line to two lines: they are both singly and doubly quilled. The outer surface or epidermis of this bark is characterized by numerous transverse cracks, which in the fine and middling quills are often distant from each other only from one to one and a half lines, and frequently extend

completely around the bark in the form of rings, the edges of which, as well as of the shorter cracks, are a little elevated. In some of the fine quills, however, these transverse cracks are hardly visible; but we then observe longitudinal furrows. On the larger quills the transverse cracks are interrupted, and do not form rings, and are not set so closely together. Some of the thicker quills have occasionally almost the roughness of a grater; and occasionally pieces are met with having knots or warts. The color of the external surface of Crown bark depends principally on that of the crustaceous lichens. Gray, or grayish brown, may be taken as the predominating tint: the thin quills are mostly slate, ash, or roe gray. The larger quills vary still more, and, in addition to the colors now mentioned, they are sometimes blackish gray,—even passing, in places, into liver brown. The inner surface of Loxa bark is smooth with small irregular longitudinal fibres observed thereon: its general color is cinnamon brown. The transverse fracture of small quills is even, but of the larger and coarser ones, fibrous. The powder of Loxa bark is of a deep cinnamon brown color. The odour of this bark is like that of tan; its taste astringent, bitter, and somewhat aromatic.

Botanical history.—*Cascarilla fina de Uritusinga*, or genuine Loxa bark, is admitted by most writers to be obtained from the *Cinchona condaminae*. It has, however, been supposed that this tree, which is said to be comparatively scarce, could not yield all the Loxa bark of commerce; and hence the latter has been referred to some other species, and the *C. scrobiculata* has been usually fixed on, in consequence of a remark made by Humboldt, that the young barks of these two species are hardly distinguishable in commerce. Various arguments, however, are advanced by Bergen against this notion, and he declares himself in favor of the *C. condaminea*, as the mother plant of Loxa bark. One fact he adduces deserves especial attention: the lower part of the branch of the *C. condaminea*, represented in the tenth plate of the first volume of the "*Plantas Equinoxiales*," actually presents

the same numerous transverse annular cracks already described as belonging to the Loxa bark of commerce.

Chemical properties.—We have two analyses of this kind of bark: one by Pelletier and Caventou, the other by Bucholz. In sixteen ounces of commercial Loxa bark, the last mentioned writer found the following soluble constituents:—

	Drs.	Grs.
Fatty matter, with chlorophylle	1	0
Bitter soft resin	2	0
Hard resin (red insoluble coloring matter)	12	0
Tannin, with some minims of acetic acid	3	0
Cinchonia	0	28
Kinic acid	1	30
Hard resin, with phyteumacolla	1	47
Tannin, with chloride of calcium	4	25
Gum	5	40
Kinate of lime	1	40
Amylum, a small quantity.		

But, though quinia is not here mentioned, there is no doubt but that it exists in this kind of bark, though in small quantity. Von Santen gives the following quantities of sulphate of quinia obtained from 100 lbs. of Loxa bark:—

	Ounces.
Thin selected quills	1.042
Moderately thick pieces	4.444
Selected thick heavy pieces, with grater-like bark	11.104

2. *Silver or Gray Cinchona.*

History and synonymes.—This bark was first carried to Santander, in Spain, in the year 1799, by the frigate *La Veloz*. It is known in this country by the name of *Silver* or *gray Cinchona*; in France by that of *Lima bark*; in Germany by that of *Huanuco*, *Yuanuco*, or *Guanuco bark*.

Commerce.—It is imported usually in chests containing about 150 pounds, and also, though less frequently, in serons of from 80 to 100 pounds.

Characters.—It always occurs in the form of quills, no flat pieces being known. These quills are larger and coarser than those of Crown bark: the largest even approximate to those of Yellow bark, from which they are distinguished by the greater smoothness of their external surface. The length of the quills is from three to fifteen inches; their diameter from two lines to one and a quarter, or even two inches; their thickness one-third of a line to five lines. We observe on the epidermis transverse cracks, but they do not form rings, as in the Loxa or Crown bark. On the thicker quills longitudinal furrows are observed; and in these cases the transverse cracks are frequently wanting. The color of the epidermis is whitish: in the smaller quills it is a uniform whitish gray, while in the large quills we observe a kind of cretaceous covering. This whitish appearance, from which, indeed, the terms silver and gray given to this bark are derived, depends on some crustaceous lichens, as I have already observed. The structure of the inner surface of this kind of bark is, in the small quills, smooth; in the larger ones, fibrous: the color is rather reddish, or rusty brown, than cinnamon brown. The fracture is even, and resinous; the odor clayish or sweet, and which Bergen says is peculiar to this kind. The taste is astringent, aromatic, and bitter; the powder of a deep cinnamon brown.

Botanical history.—The tree yielding this bark is unknown.

Chemical history.—I am not acquainted with any analyses of this bark, though several chemists have examined it with the view of determining the nature and proportion of its active principles. The following are their results:

Quantity in a pound of Bark.

		Cinchonia.	Quinia.
Von Santen	from 106½ to 210 grains		.....
Michaelis	} finest quality	50	32 grains
		74	28
Goebel and Kirst	. . .	168	.....

Ash Cinchona Bark.

History and synonymes.—It is uncertain at what period this bark was introduced into commerce, but it was probably among the earliest varieties introduced. Bergen states he found it in an old collection of drugs made in 1770. It has long been known in English and German commerce, but was unknown to the French until I sent samples to Professor Guibourt, who, in the last edition of his "*Histoire Abrégée des Drogues*," speaks of it as a variety of Loxa bark: in this I think he is in error, for it does not appear to me to possess the characteristic marks of Loxa bark.

In Germany it is called *Jaen Cinchona*, after a province in South America of that name. The term Jaen has become corrupted into *Ten*, by which name this bark is designated; or to distinguish it from the pseudo-Loxa bark, also called by this name, it is termed *pale ten cinchona*.

Commerce.—It is imported usually in chests of from 110 to 140 lbs.; but we meet with it also in serons of from 70 to 100 lbs.

Characters.—This bark is met with in a quilled form only: the quills being of middling size, or somewhat thick; being from 4 to 16 inches long, from $3\frac{1}{2}$ lines to 1 inch diameter, and from $\frac{1}{2}$ to 2 lines thick. A very remarkable character connected with this bark is the crookedness of the quills, which are more or less arched and twisted; from which circumstance we may infer the probability of its being obtained from a tree which grows in a damp situation. On the outer or epidermoid surface we observe a few transverse cracks, and some faint longitudinal cracks; but in these respects there is a manifest difference between this and Loxa bark. The color of the outer surface varies between ash gray, whitish gray, and pale yellow, with blackish or brownish spots. The inner surface is either even or splintery, and of a cinnamon brown color. The fracture is even or splintery; the odor is tan-like; the taste feebly astringent and bitter. The color of the powder cinnamon brown.

Botanical history.—According to Bergen, the Ash bark is identical with the *Cascarillo palido* of Ruiz, which is obtained from the *Cinchona ovata* of the Flora Peruviana, and which is the *C. pubescens* of Vahl.

Chemical history.—No distinct analysis of this bark has been made. Here are the results of some experiments made to determine the proportion of active principle:—

Quantity of Active Principle in a Pound of the Bark.

		Quinia.	Cinchonia.
Michaelis	{ 1st sort . . .	44 grs.	12 grs.
	{ 2d sort . . .	80 grs.	12 grs.
Goebel and Kirst	. . .	12 grs.	none.

Dark Ash Bark, — False Loxa, — Dark Ten Cinchona
Under the name of *China Pseudo Loxa*, or “*Dunkele Ten-China*,” Bergen has described a bark which has many of the properties of Ash bark, and which is found mixed with the Loxa bark of commerce. It is principally distinguished from the Ash bark by the irregular longitudinal wrinkles and transverse cracks, and by its darker color. Guibourt regards it as an inferior kind of Loxa bark. Batka regarded it as a species of Buena; but Bergen says it agrees with a bark in the collection of Ruiz, said to be obtained from the *C. lancifolia* of Mutis.

(b.) *Yellow Barks (Cinchona flava.)*

4. *Yellow Bark of English Commerce.*

History and synonymes.—Dr. Relph tells us, that in a letter received from a Spanish merchant at Cadiz, in September, 1789, it is stated that the yellow bark had been lately known there, and that the first parcel which arrived was tried at Madrid, and immediately brought by the king’s order, for his own use. From this circumstance, it was distinguished by the name of *royal yellow bark*, and on the continent it is still known by this appellation. The Germans call it *Königs-China*, or *China regia*; the French, *Quinquina jaune royal*. There is another name by which it is frequently known—

Calisaya bark (*Quinquina Calisaya* of Guibourt;) and which Humboldt says is derived from a province of that name in South Peru, in which the tree yielding this bark grows. In English commerce it is known merely by the name of *yellow bark*, an appellation rather unfortunate, as we shall presently find, since the same term is applied on the continent to another variety—the Carthagena bark.

Commerce.—It is imported in serons and chests.

Varieties and characters.—In commerce, two varieties of yellow bark are met with—namely, the *quilled* and the *flat*. The finest quills are selected for filling the show bottles in druggists' windows; and in some of the shops at the west end of London very fine samples are seen.

(a.) *Quilled yellow bark* (*Cinchona regia tubulata* seu *convoluta*.)—The quills vary in length from 3 to 18 inches,—in diameter, from 2 lines to $1\frac{1}{2}$ or even 2 inches,—in thickness, from $\frac{1}{2}$ to 6 or 7 lines. Very small quills, however, are rare; those usually met with having a diameter of from 1 to $1\frac{1}{2}$ inches, and a thickness of from 3 to 6 lines. Sometimes they are doubly, though in general they are singly quilled. The quills are in general coated. On their external surface they are marked by longitudinal wrinkles and furrows, and predominating transverse cracks, which often form complete circles around the quills, and whose edges are usually raised. These furrows and cracks give a very rough character to this kind of bark, by which, indeed, it may be readily distinguished from the large quills of the gray or Huanuco bark. The color of the epidermis is more or less light gray; in those spots where the epidermis is wanting, the outer surface of the bark is of a brown color. In other characters the quilled and flat pieces agree.

(b.) *Flat yellow bark* (*Cinchona regia plana*.) The pieces of this variety are from 8 to 15 even or 18 inches long,—from 1 to 3 inches broad—from 1 to 5 lines thick. They are but little curved or arched. In general the pieces are uncoated (*Chinu regia nuda*.) Sometimes the uncoated pieces are found by drying to have become convex on the inner, and concave on

the outer side. When the coating is present, it agrees in characters with the coated quilled yellow bark already described, in having wrinkles, furrows, and transverse cracks, and in the color of the epidermis.

The inner surface of both quilled and flat pieces is even and often almost smooth. On examination, it is seen to consist of fine closely set longitudinal fibres. Its color is cinnamon brown; the same color is also perceived on the outer side of the bark in the places where the coating is removed.

Botanical history.—It is, I think, still uncertain what tree yields the yellow bark of English commerce. It is stated by Mutis, that the *Cinchona cordifolia* yields the *Quina amarilla*, or yellow bark; and hence, in the Pharmacopœia and other works, our yellow bark is stated to be the produce of *C. cordifolia*; but this is an error, arising from the circumstance of the term yellow bark (*China flava*) being applied on the continent to that which we call Carthagena bark; and Guibourt tells us that the authentic specimens of the yellow bark of Mutis, brought by Humbolt, are, in fact, specimens of Carthagena, and not of Calisaya bark.

Mutis states, that the *Quina naranjada* (orange Cinchona bark,) is obtained from the *C. lancifolia*; and as many persons regard the orange bark of Mutis as synonymous with the Calisaya, or yellow bark of English commerce, we find that several writers attribute the latter bark to the *C. lancifolia*. Notwithstanding the authority of the persons who have espoused this opinion, I cannot admit it, since both Bergen and Guibourt declare Calisaya bark is not the orange bark of Mutis. The former examined the *Quina naranjada* (*C. lancifolia* of Mutis) in Ruiz's collection; the latter the *Quinquina orangé de Mutis*, in the *Muséum d'Histoire Naturelle* at Paris.

Chemical composition.—Pelletier and Caventou have published the following as the constituents of Calisaya, or yellow bark:—

Superkinate of quinia.

Fatty matter.

Slightly soluble red coloring matter (*red cinchonic.*)

Soluble red coloring matter (*tannin.*)

Yellow coloring matter.

Kinate of lime.

Lignin.

Amidine.

Subsequently to this analysis, cinchonia has been discovered in this bark.

The quantity of quinia and cinchonia contained in this bark has been examined by several chemists. The following are two sets of results, which, unfortunately, are discordant:—

MICHAELIS.

Quantity of Quinia in a pound of Bark.

Quilled yellow bark	154 grs.
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Flat uncoated yellow bark	286
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GOEBEL AND KIRST.

Thin quills	60
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Thick quills and coated flat pieces	84
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Uncoated flat pieces	95
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When I speak of sulphate of quinia, I shall enter more fully into this subject.

(c.) *Red Bark (Cinchona ruba.)*

5. *Red Cinchona Bark of Commerce.*

History and synonymes.—Dr. Fothergill, in a letter to Dr. Saunders, states, that in the year 1702, a parcel of bark was taken on board a Spanish vessel, and a portion of it fell into the hands of a celebrated London apothecary, Mr. D. Pearson. According to Dr. Fothergill, it was the red bark. In 1779, another Spanish ship, bound from Lima to Cadiz, was taken by an English frigate, and carried into Lisbon. Her cargo consisted principally of red bark, and was for the most part sent to Ostend, where it was purchased at a very low price by some London druggists, who, after some difficulty, contrived to get it introduced into practice. Such are the circumstances

attending the first introduction of red bark into English, or I may say into European, practice. It deserves, however, to be noticed, that some South American travellers had already alluded to a red bark, (*Cascarilla colorada*), though it is uncertain whether they referred to this variety.

The *red bark* of English commerce is synonymous with the *China rubra* of Bergen and other German pharmacographers. It includes the *Quinquina rouge non verruqueux* and the *Quinquina rouge verruqueux* of M. Guibourt.

Commerce.—It is imported in chests; never, I believe, in serons. Good red bark may be regarded as comparatively scarce; and I am informed by an experienced dealer that it was formerly imported in much larger sized pieces than are now met with.

Characters.—It occurs in quills and flat pieces. The quills vary in diameter from two lines to an inch and a quarter; in thickness from one-third to two lines; in length from two to twelve or more inches. The so-called flat pieces are frequently slightly curled: their breadth is from one to five inches; their thickness from one-third to three-quarters of an inch; their length from two inches to two feet. Red bark is usually coated; its outer surface is usually rough, wrinkled, furrowed, and frequently warty: the presence of warts constitutes the variety called by Guibourt *Quinquina rouge verruqueux*. The color of the epidermis varies: in the thinner quills it is grayish brown, or faint red brown; in thick quills and flat pieces it varies from a reddish brown to a chesnut brown, frequently with a purplish tinge. As a general rule it may be said that the larger and coarser the quills and pieces, the deeper the color. Cryptogamic plants are not so frequent on this as on some other kinds of bark. The rete mucosum is frequently thick and spongy in red bark, much more so than in yellow bark. The inner surface of the bark is, in fine quills, finely fibrous; in large quills and flat pieces, coarsely fibrous, or even splintery: its color increases with the thickness and size of the pieces: thus in fine quills it is light rusty brown; in thick quills and flat pieces it is a deep reddish or

purplish brown. Some of the specimens of red bark which I received from Von Bergen approach yellow bark in their color. The transverse fracture is, in fine quills, smooth; in middling quills, somewhat fibrous; in thick quills and flat pieces, fibrous and splintery. The taste is strongly bitter, somewhat aromatic, but not so intense and persistent as that of yellow bark; the odor is feeble, tan-like: the color of the powder is faint reddish-brown.

Botanical history.—The tree which yields red bark of commerce is at present unknown. It has been usually supposed to be obtained from the *Cinchona oblongifolia*, but this is in all probability erroneous. This species of *Cinchona* yields a bark called *Quina roxa* or *Quina Azahar o roja de Santa Fe*; and which was supposed to be our red bark. But Bergen has examined the bark bearing this name in the collection of Ruiz, and finds that it is not our commercial red bark, but another kind, known in France by the name of *Quinquina nova*. Moreover, Schrader (who received a piece of the bark of the *Cinchona oblongifolia* from Humboldt) declared it to be a new kind; and Guibourt states that the red bark of Mutis, which was deposited by Humboldt in the Museum of Natural History of Paris, is not commercial red bark, but *Quinquina nova*. To these statements may be added the testimony of Ruiz and Pavon, and of Humboldt; the two first of which writers state that the *Quina roxa* is obtained from the *Cinchona oblongifolia*, but that they do not know the origin of *Quina colorada* (the red bark of commerce;) and Schrader states that Humboldt declared he did not know the tree that yielded red bark.

Chemical composition.—Pelletier and Caventou analysed the non-verrucous variety of red bark, and found the following constituents:—

A large quantity of *superkinate of quinia* and of *superkinate of cinchonina*.

Slightly soluble red coloring matter (*red cinchonina*.)

Soluble red coloring matter (*tannin*.)

Yellow coloring matter.

Fatty matter.

Kinate of lime.

Ligneous matter.

Amidine.

Several persons have attempted to determine the absolute and relative quantities of cinchonia and quinia obtained from the varieties of red bark.

From one pound of Bark

<i>Von Santen's Results.</i>	Cinchonia.	Sulphate Quinia.
1. Fine quills of fresh appearance (from Cadiz, in 1803)	70 grains.	77 grains.
2. Large, broad, flat pieces, of fresh browned appearance (same chest)	90	15
3. Middling quills, from their pale appearance probably 20 years older than the previous (from Cadiz in 1819)	97	31
4. Broad flat pieces, not so thick as No. 2, (same chest as No. 3)	80	30
5. Middling quills, heavy, old (from London to Hamburg in 1815: not met with now) .	150	11
6. Thicker heavier quills (same chest) .	184	9
7. Thick flat pieces, quills, and fragments (above 80 years in Hamburg: a pale kind)	20	7

The following are the results of other chemists:—

	Cinchonia.	Quinia.
Michaelis obtained from 1 lb. of bark	32 grains.	64 grains.
Goebel and Kirst (quills and flat pieces)	65	40

(d.) *Brown Bark (Cinchona fusca.)*

6. *Huamalies, or Brown Bark.*

History and synonymes.—It is not known precisely when this kind of bark first came into Europe. Von Bergen thinks probably at the end of the last or commencement of the present century. This bark is not used in this country, and hence most druggists are unacquainted with it; but it is bought by some of our larger dealers for the foreign market.

Commerce.—It is imported in chests; never in serons.

Characters.—It is a thin, spongy bark, and occurs in quills and flat pieces. Many of the quills agree in their physical characters with that kind of bark which our druggists denominate *rusty*, and which is picked out of the serons of Loxa

bark. Some of the finer and thinner quills agree in their appearance with what the French term *Havannah bark*, (in consequence of which Guibourt arranges Huamalies bark among the gray or pale barks,) and are very different to the largest quills and flat pieces, which are thin and spongy, and have a rusty brown color, their external surface having numerous wrinkles and warts. The taste of Huamalies bark is aromatic, and slightly astrigent.

Botanical history.—It is not known what tree yields this bark.

Chemical history.—I am not acquainted with any regular analysis of this bark. From the experiments of Michaelis, as well as of Goebel and Kirst, it appears to contain quinia and cinchonia.

In a pound of Bark.			
		Quinia.	Cinchonia.
Michaelis	{ 1st sort . .	12	..
	{ 2d sort . .	28	48
	{ 3d sort . .	34	60
Goebel and Kirst . . .		28	38

Section 2.—True Cinchona Bark having naturally a whitish epidermis. (White Cinchonas.)

I think it most convenient to arrange these under three heads, according as they approach the pale, yellow, and red barks, already described.

(a.) *Pale Barks, with a White Epidermis.*

1. *White Loxa Bark.*

Among the Loxa or Crown bark of commerce, we meet with quills having a white epidermis. Guibourt calls them *Quinquina blanc de Loxa*.

(b.) *Yellow Barks, with a White Epidermis.*

2. *Carthagen Bark.*

History and synonymes.—It is uncertain how early this bark was introduced into Europe. Bergen says it was first met with at public sales, in the year 1805. In Germany it is denominated *yellow bark*, (*Cinchona flava*,) and hence it has sometimes been confounded with and substituted for the

yellow bark of English commerce, which is called on the continent Calisaya, or Regia bark.

Bergen speaks of two distinct kinds of Carthagena bark.

1st. The *china flava fibrosa*, called in this country *fibrous or woody Carthagena bark*, and which I find to be identical with a specimen sent me by M. Guibourt, under the name of *Quinquina de Colombie ligneux*.

2. *China flava dura*, or *hard Carthagena bark*, which includes the *Quinquina de Carthagene jaune*, and the *Carth. brun*, of Guibourt.

As both kinds are imported in the same parcel, and from the same place, and are sold as one kind here—as both appeared in commerce for the first time together—and as their physical appearances are very similar, I shall consider them as one kind. Geiger suggests whether they may not be the bark of the same species at different seasons, or growing in different situations.

Commerce.—It is imported in drum-like serons, and in half chests.

Characters.—It occurs in quills and flat pieces, the leading characters of which are the thin soft epidermis, whose color is between yellowish white and ash gray, with a micaceous appearance: sometimes the epidermis is wanting. The color of the inner surface and other parts of the bark is ochre yellow. The transverse fracture is fibrous and splintery, especially in the variety called from this circumstance *fibrosa*. The odor is slight, the taste slightly bitter, and astringent. The color of the powder varies from that of cinnamon to ochre yellow.

Botanical History.—I have already mentioned in speaking of the yellow bark of English commerce, that Carthagena bark is obtained from the *Cinchona cordifolia*.

Chemical history.—Pelletier and Caventou have analysed one kind of Carthagena bark (Guibourt says it was the variety he terms *brown*), and obtained the following results:—

Kinates of quinia and cinchonia.

Yellow coloring matter.

Tannin.

Red Cinchonic.

Gum.

Amylum.

Kinate of Lime.

Lignin.

Various experiments have been made to ascertain the quantities of Quinia and Cinchonia present. The following are the results of Goebel and Kirst:

	Quinia.	Cinchonia.
1lb. hard Carthagena bark . . .	56 grs.	43 grs.
1lb. fibrous Carthagena bark . . .	54 grs.	no trace.

If this analysis be correct, it certainly shows a remarkable distinction between the two kinds.

3. Cusco Bark.

This bark has only been known during the last seven years. It is the *Ecorce d'Arica* of Pelletier, and *China rubiginosa* of Bergen; but it is not described in the monograph of this last writer. It is characterized by a white, smooth, uncracked epidermis; which, however, is sometimes partially or wholly removed by the orange red tint of the other parts of the bark, by its fibrous appearance, and lastly, by an infusion of it not precipitating a solution of the sulphate of soda. This bark principally deserves notice in consequence of MM. Pelletier and Coriol having discovered in it a new alkali, which they have termed *Aricina*.

(c.) Red Barks with a White Epidermis.

4. Cinchona Nova.

History and synonymes.—The *Quinquina nova* is placed by Guibourt among the false Cinchonas, though I know not for what reason, since he asserts it is the red bark of Mutis, which is obtained from the *Cinchona oblongifolia*. In speaking of the origin of the red bark of commerce, I have already mentioned that Bergen declares the *Quina roxa* (obtained from *C. oblongifolia*) of Ruiz's collection, to be the *Quinquina nova* of commerce. On these grounds, then, I

have placed this bark among the genuine Cinchonas. It is also called, by some pharmacologists, *Surinam bark*.

Characters.—It occurs in flat or arched pieces, or even quills sometimes a foot long: its epidermis is smooth, whitish, with few cryptogamic plants, with transverse cracks or fissures. The general color of the bark is pale red, but which becomes deeper by exposure to the air. It has an astringent somewhat bitter taste. In general appearance it has no resemblance to any other Cinchona barks (true or false) that I am acquainted with.

Botanical history.—I have already mentioned the facts from which we infer its origin from the *C. oblongifolia*.

Chemical history.—It has been analysed by Pelletier and Caventou, with the following results:

A fatty matter.

Kinovic acid.

A red resinoid matter.

Astringent matter.

Gum.

Starch.

Yellow coloring matter.

Alkalescent matter in very small quantity.

Lignin.

5. *Other Red Barks with a white epidermis.*

Among the red bark of commerce we frequently find samples having "a white epidermis. This is the kind called by Guibourt *Quinquina rogue à épiderme blanc et micacé*. There is another paler kind which he terms *Quinquina rogue pâle*.

DIV. II.—*False Cinchona Bark.*

Under this division are placed those barks which have been introduced into commerce as Cinchonas, but which are not obtained from any species of Cinchona. Their physical characters are for the most part very different from those of the genuine: moreover, they are not known to contain quinia, cinchonina, or aricina. I do not intend to describe them, but shall content myself with naming, as examples, the *Pitaya* or *Bi-colored bark*, the *Piton* or *St. Lucia bark*, the *Caribbean bark*, &c.

ART. XLVII.—ON THE USE OF GOLD-DUST AND IRON-FILINGS AS A GALVANIC ANTIDOTE TO CORROSIVE SUBLIMATE, AND ALL THE OTHER POISONOUS COMPOUNDS OF MERCURY. BY T. H. BUCKLER, M. D., of Baltimore.

THE compounds of mercury being, without exception, more or less poisonous, it would seem that the only single method of rendering them innocuous, is to revive the metallic mercury, and thus separate it from the agents with which it is combined. Of all the compounds of mercury, corrosive sublimate—*bichloride of mercury*, *oxymuriate*, *corrosive muriate*—is the one for which it is most desirable to procure a suitable antidote. It is somewhat curious that this agent, possessing so wide a range of chemical affinities, should have baffled chemists and toxicologists for so long a time, in their numerous efforts to find some direct chemical agent capable of decomposing it in the stomach, and thereby prevent the corrosive and deadly action which so surely follows its presence—unless in the smallest quantity—in that organ. The difficulty has arisen, of course, from the more or less poisonous nature of all its compounds. It has even been shown that corrosive sublimate possesses the properties of an acid, and unites with the alkalifiable bases; but here, as in other instances, the compounds resulting are even more intense irritants than the bichloride itself. The inutility of finding an antidote to an agent so deadly in its effects, may be urged by many, although it is not a more powerful irritant than oxalic acid, for which latter we have, luckily, a ready and certain antidote, and on this account alone, we are enabled to predict a very different result where it has been taken into the stomach, than we would be likely to foretell if corrosive sublimate were swallowed. It is therefore idle to say, that it is useless to attempt to find some more certain antidote to this most deadly poison: more especially, when even the observations that have been made on poisoning with prussic acid, have been productive of practical

advantage. In this view, the importance of having a suitable antidote, is growing daily more apparent; for, setting aside the instances in which it may be taken with suicidal intent, and the risks incurred by its universal employment in destroying insects, it is extensively used in the arts, and has been introduced of late, especially in the operation of tanning, and also to prevent the decay of timber: thus exposing a numerous class of operatives to the accident of swallowing it. Even a familiar acquaintance with the deadly nature of corrosive sublimate, is not always a guarantee against the risk of taking it into the stomach. Thenard, the chemist, while at lecture, on one occasion swallowed a concentrated solution of this salt, in place of water, but luckily discovered his mistake before he had taken enough to prove fatal. A druggist of our city, while talking, inadvertently took from his counter a lump of the bichloride and swallowed it. He had fortunately eaten a full meal a short time before, and on taking an emetic of sulphate of zinc, the piece was instantly rejected, with the contents of the stomach. It is well known that numerous agents have been at various times suggested as capable of rendering this salt innocuous. The only antidotes now recognised are gluten and albumen; the former having been suggested by Professor Taddeï, of Florence—the latter by Orfila. Each of these promised to be perfect when first announced; but that of Orfila, for many reasons the best, is now the established antidote. Recent investigations have shown that albumen is not so certain in its action as was at first supposed, it having been ascertained that the precipitate which it forms, is re-dissolved when the albumen exists in excess. “The precipitate is soluble in a considerable excess of albumen: so that whenever albumen abounds in any fluid to which corrosive sublimate has been added, a portion of the mercury will always be found in solution.”—*Christison*, p. 279. It is therefore apparent, if this be true, that if it were possible to know the quantity of the solution our patient had taken, we could not, in the hurry of administering albumen, (even if we knew the exact quantity required,) give just so much as would neutralize the so-

lution, but must be constantly liable to the error of giving too little, or so much as to keep the salt of mercury in solution. Albumen acts by causing the disengagement of one portion of chlorine, thus converting the bichloride into calomel, which renders the patient liable to be salivated, an evil which, if none other existed, it would be as well if possible to prevent; besides, toxicologists number calomel amongst the compounds of mercury for which it is desirable to procure an antidote. Perhaps another reason why the exhibition of albumen is not followed with better success, arises from the fact that corrosive sublimate is not more active in its affinity for albumen than for the mucous membrane of the stomach itself; the experiments of Berthollet having shown that the same power of reducing the bi. to a protochloride, belongs to all animal solids and fluids. On this account, no chemical diversion can be excited by the presence of the albumen, since the solution of mercury does not unite with it by virtue of any peculiar elective attraction, over that which it has for the tissues of the stomach and bowels; on which latter it exerts its energies often to a fatal extent, although albumen is present in them at the time.

Not long since, we were called to witness a most melancholy case of poisoning in a young gentleman of robust health, who had swallowed, with suicidal intent, three ounces and a half of a saturated solution, (about fifty-five grains,) of corrosive sublimate. Eggs were at hand, and ten minutes had not elapsed from the time he took the poison, when we gave him at least a quart of a solution of albumen, and continued to administer it for some hours. It is not our purpose to state this case fully; suffice it to say, that the symptoms were such as are usually described, and most violent. There is one circumstance, however, worthy of notice in this place, as it serves to show the weight of the objections above stated—it is this:—The bowels were not acted on until nearly three hours after the solution was swallowed, (ample time, we should think, for the affinities of the mercury to have been supplied by the albumen,) and yet, when the dejections did take place, they

contained so much mercury in solution, that the skin surrounding the anus was excoriated, precisely as if a strong solution had been directly applied. In spite of the albumen, which was largely administered, the corrosive action was exerted on the mucous membrane of the stomach and bowels for eight hours, producing during the whole of this time the most excruciating agony. So soon, however, as the chemical action was at an end, there was comparative calmness and freedom from pain. He died on the eighth day; and we feel warranted in the belief, that had we possessed some agent capable of decomposing the solution within the first half hour, his chance of recovery would have been good. We do not mean to disparage the importance of albumen as a demulcent and diluent, and are disposed to believe that more good is to be attributed to these qualities, than to its chemical agency.

It would seem, then, that the object is still to obtain an antidote, for which corrosive sublimate possesses affinities largely predominant over the tendency it has to combine with animal constituents, and it is with the hope of fulfilling this indication, that we have been induced to make the following experiments. The agents by which we propose to render the bichloride innocuous, are iron-filings and gold-dust: it will be at once seen that their mode of action is referrible solely to the phenomena of galvanism. Thus, if we place a drop of a solution of corrosive sublimate on a polished piece of gold or iron, the surface of the two metals will remain bright at the point covered by the drop for a long time, unless we bring the iron and gold in contact, through the solution, when both metals become instantly tarnished: the iron oxydized, and the gold coated over with metallic quicksilver. If we drop into a solution of mercury a polished card-tooth, to which we have caused particles of gold to adhere, it will become tarnished the moment it comes in contact with the fluid, and a globule of quicksilver combined with the gold, may be seen hanging to it, as it falls to the bottom of the solution. If, in like manner, we throw gold-dust into a solution of mercury, no action will take place until we add iron-filings, when the metallic mer-

cury is at once revived, and will be seen to precipitate in a state of amalgam with the gold: at the same time, the oxygen from the corrosive sublimate goes over to the iron, and forms an oxide of that metal, with which the chlorine combines, leaving a hydrochlorate of iron in solution. The products of this decomposition are wholly innocuous, the amalgam of the two metals being entirely inert, and the hydrochlorate of iron possessing only the properties of a slight tonic. Two grains of gold and two of iron are sufficient to decompose five grains of corrosive sublimate, so that no trace of mercury can be detected by the most delicate test.

In order to insure a rapid decomposition of the salts of mercury, it is important that both metals should be in the minutest state of division. The iron we made use of was reduced almost to an impalpable powder, by working a piece of steel with the finest file. The gold can be procured at all times, in the state of bronze; as this is liable, however, to impurities, it is better to have it prepared expressly for the purpose, in the ordinary way of reducing it to powder, or by filing. Gold-leaf may also be used. Both metals should be so minutely divided, as to be capable of suspension for a short time, in any fluid, and form, when agitated in water, as it were, a gold and iron solution. For it is the galvanic action excited at the moment, that each particle of one metal comes in contact with a particle of the other, that the corrosive fluid immediately surrounding them is decomposed; and hence, in order to render rapidly innocuous a considerable bulk of a solution of corrosive sublimate, it is important that both metals should be as widely and intimately diffused in it as possible. This method of decomposing the bichloride, applies with equal force to all the more soluble compounds of mercury for which no antidote has yet been suggested. The deuto-iodide of mercury in water, is instantly deprived of its bright vermilion lustre, on the addition of gold and iron, and a gray precipitate, composed of an insoluble iodate of iron and an amalgam of gold and quicksilver, is the result. If we take the peroxide of mercury, (red precipitate, red oxide of mercury,) and

throw in gold and iron-filings, the oxygen of the precipitate instantly passes over to form a peroxide of iron, while the revived quicksilver amalgamates with the gold. So likewise, the proto-nitrate and acetate mercury, when similarly treated, form severally a nitrate and acetate of iron, while the metallic mercury being revived, combines of course with the gold.

The more insoluble compounds of mercury, for which it is extremely desirable we should possess an antidote, are not so readily decomposed by the presence of gold and iron: but we are aware at the same time, that this class of agents act more slowly on animal tissues, and also that some soluble salt must be formed, by the action of the stomach, before they can prove deleterious. These compounds are, first, cinnabar—*bisulphuret* or *vermilion*: second, turbith mineral or *sub-bisulphate*: third, white precipitate or *hydrargyrum ammoniatum* of the Pharmacopœia: amongst these, calomel may also be classed. Now, before any of the last named substances can prove deleterious, some soluble salt must be formed by the action of the stomach, which, when formed, instead of acting on the coats of the stomach, will be decomposed by the presence of gold and iron, as we have before seen in regard to the other soluble salts. It was our intention to have made a number of experiments on animals, aided by Professor W. R. Fisher,* who

* This gifted son of Pennsylvania, during twelve years' residence in our city, devoted his time and the energies of a highly cultivated intellect, almost solely to the study of chemistry and pharmacy. Two summers since he was called, unsolicited on his part, to the chair of chemistry in the University of Maryland, a station which he occupied with distinguished credit to himself, and marked advantage to his class. His lectures, written in a style remarkable for its elegance and force, were delivered in a manner at once animated and natural, while the happiest facility of illustrating, by experiment, the numerous and varied points under discussion evinced a familiarity with chemical manipulations, which can only be acquired by long experience. That he possessed, indeed, all the qualities essential to an accomplished and eloquent teacher of chemistry, was accorded by all who had the gratification to hear him. Ever ready to take the lead in any thing useful or scientific in its objects, he had laid plans to establish a College of Pharmacy in our city. During the past spring, in the pride of youth and usefulness, he had the misfortune to be attacked

kindly offered his assistance; but owing to the late illness of this gentleman, our plan was defeated. For the purpose, however, of ascertaining how far the proposed antidote can be depended on, when brought to the test of positive experiment, and to be assured that no deleterious compounds result from this method of decomposing the salts of mercury, we procured four half grown rabbits, on which the following experiments were performed, assisted by Mr. D. Stewart, one of the ablest chemists and pharmacologists of our city, and well known to the profession generally on account of his valuable contributions to the American Journal of Pharmacy.

Experiment 1st.—Injected into the stomach of a half grown rabbit, one grain of the peroxide of mercury in $\mathfrak{z}\text{ii}$ of water, and shortly after, five grains of iron-filings and the same quantity of gold-dust, in half an ounce of water. This rabbit manifested no pain or distress of any kind; began to eat shortly after the experiment was performed, and has not since appeared the least sick.

Experiment 2d.—Gave in like manner, to a rabbit of the same size and strength as the preceding, three grains of the deuto-iodide of mercury in $\mathfrak{z}\text{ss}$ of water, and used as an antidote, gold-dust and iron-filings, each six grains: result the same as in the preceding experiment; this rabbit is now thriving.

Experiment 3d.—Injected into the stomach of another rabbit of the same size and age, three grains of the white oxide of mercury, and some minutes after, administered four grains of finely divided gold and five of iron-filings: the rabbit appeared perfectly well until the next day, when it lost its

with partial paralysis of one side, which induced him, so soon as he had sufficiently recovered, to abandon the arduous duties of his occupation here, and seek repose at home. We rejoice to hear that he is rapidly convalescing, and we sincerely hope that he may soon regain his health, and be enabled to reap the ripe harvest of his well spent time, in the continued pursuit of a science to which his talents promised to lend important aid.

appetite and seemed drooping and sick; on the third day it commenced eating, and is now perfectly well.

Experiment 4th.—Injected into the stomach of the last rabbit, four grains of corrosive sublimate in \mathfrak{z} ss of water, and used as the antidote, four grains of gold-dust and six of iron-filings in \mathfrak{z} ss of water: this rabbit began to eat shortly afterwards, manifested no distress, and is now perfectly well.

In all of the above experiments, a small quantity of gum was added to the antidote, for the purpose of suspending the metals. It being impossible to know, *a priori*, that gold and iron in a minute state of division, might not alone prove fatal to a rabbit, our first experiment was made more to determine the effect of the antidote itself: therefore only one grain of the peroxide of mercury was given—a quantity insufficient to produce death; and yet calculated to give rise to great distress, or at least loss of appetite, unless decomposed by the antidote. It appeared to be conclusive from this trial, that gold and iron exert no deleterious effect, and also that the peroxide must have been decomposed, inasmuch as the rabbit began to eat shortly after the experiment was performed, and has not since appeared the least sick. Dr. Niel has recommended an ointment, composed of one grain of finely divided gold to thirty-six of lard, to be applied to a blistered surface, in scrofulous affections, as a substitute for the hydrochlorate and other preparations of that metal. What possible effect Dr. N. could have anticipated from this plan of treatment, we are at a loss to determine, since gold is only soluble in nitro-muriatic acid, and cannot, therefore, undergo any change if applied to a blistered surface, or introduced into the stomach. We believe that one grain of the deuto-iodide of mercury would be sufficient to kill a rabbit, and we are justified in this belief, from the distress often occasioned where it is administered medicinally, in doses of one-eighth of a grain: and yet, in our second experiment, three grains of this agent were given, without any sensible effect.

We have before observed, that gold and iron do not decompose the more insoluble compounds of mercury, when brought

in contact out of the stomach. The action of these metals as an antidote to the insoluble compounds of mercury generally, and their effect in our third experiment, in which three grains of the white oxide of mercury* were given, may, however, be explained by the phenomena which occur in one of the methods of making hydriodate of potash: it is known to chemists, that iodine and potash may remain in water without forming the above salt, unless a piece of iron be dropped in, when a play of affinities is at once aroused, and the iodine, leaving the iron, for which it has a powerful affinity, untouched, combines instantly with the potash. Now a part analogous to that which the iron here plays, is performed by the stomach, when the insoluble compounds of mercury are swallowed, and gold and iron are at the same time present:

* A medical gentleman of our city, ordered for a convalescent patient half an ounce of phosphate of soda; the prescription was taken to an apothecary, who sent, in its stead, half an ounce of white oxide of mercury. The nurse in attendance, when about to mix and administer the dose, suspecting it was not the medicine intended, sent it back to know if it was right; the apothecary, whose hardihood only equalled his ignorance, declared it to be the medicine ordered. With this assurance, the nurse prepared and gave to the unfortunate patient, the whole half ounce of white oxide, which soon produced the most violent symptoms, and proved fatal in about thirty-six hours. A short time after the dose had been given, the physician was sent for, and believing his patient had taken poison, he went to the apothecary and asked to see the bottle from which his prescription had been supplied: he was shown a bottle marked phosphate of soda; but which was found, on examination, to contain white oxide of mercury, the apothecary still persisting to the contrary: sufficient evidence that the mistake was not the result of accident, but could only be attributed to the grossest ignorance.

This fact, like many others that might be adduced, shows the absolute importance of our having a College of Pharmacy; indeed, in every place where physicians have, very properly, ceased to keep their own medicines, and have resigned into the hands of others one of the most important branches of our science, a College of Pharmacy, with full power to grant diplomas, appoint inspectors of medicine, and regulate the sale of poisons, has been found indispensable. So intimately is the apothecary identified with the physician in the public mind, that any fault of the former will be visited on the latter, and any act of ignorance on the part of a dispenser

the stomach forms, out of the insoluble compounds, a soluble salt, which instead of acting on the coat of that organ, is instantly decomposed by the antidote. The stomach, in every instance, being the medium, like the iron in the case of the iodine and potash, by which the affinities are brought into play.

The experiments of Sir B. Brodie and others have proved that where a solution of from six to twenty grains of corrosive sublimate is injected into the stomach of a full grown rabbit, it very soon produces difficult respiration, convulsions, and soon after death. In our last experiment, therefore, in which a solution of four grains of corrosive sublimate was injected into the stomach of a half grown rabbit, death must have ensued, unless the gold and iron had been given.

A solution of corrosive sublimate acts on the stomach purely as an irritant, or as a caustic, accordingly as a weak or strong solution is swallowed. Toxicologists have not, so far as we know, made any practical distinction between the irritant and

of medicine affects the confidence of the people in the science generally in proof of which, it is only necessary to remember the want of confidence felt by all who dealt with apothecaries, for some time subsequent to the melancholy instance above stated. It is through the same channel, that medicine will become undefinably associated in popular estimation with quackery: for how is it now? The able chemist and pharmacologists in whom the physician places a well merited confidence, is not clearly distinguished from the commonest retailer of drugs without knowledge of their qualities, or the notorious vender and advertiser of quack nostrums. In the present exact and elevated state of our science, it is right that it should be severed from all connexion with every thing which has even a shadow of quackery; and we feel confident that nothing will effect this end, repress the evils already pointed out, and tend, at present, so much to supply the wants of our profession, as the establishment of a College of Pharmacy.

The city council of New Orleans have lately, in a commendable spirit, enacted laws prohibiting the publication of quack remedies, having imposed a fine of twenty dollars on any one who advertises a specific in the daily journals, and a penalty of one hundred dollars is incurred for the offence of placarding a remedy at the corners of the streets. We can scarcely look at a daily newspaper, without seeing at a glance, certificates palming off the virtues of some notorious patent specific, the advertisement of quack nostrums by an apothecary, and the wonderful perform-

caustic strength of a mercurial solution, but we deem it of the greatest importance, in the treatment of poisoning with corrosive sublimate, to notice the difference. A solution of this salt, in its caustic strength, will produce an irrecoverable condition of things in a few minutes; whereas a solution only irritating in effect, may remain on the stomach for a greater length of time, without producing any fatal lesion. For example: we applied a saturated solution of corrosive sublimate to a blistered surface; it produced the most excruciating torment, and on examining the surface some hours after, the true skin had lost its vitality in patches, which presented a white polished, and shining appearance; about the third day, all the parts which had assumed the character described were found separated at their margins from the healthy skin, by a clearly defined fissure, and between the sixth and tenth days, they came away, leaving healthy ulcers, with perpendicular walls, and corresponding exactly to the thickness of the skin in

ance of some ycleped surgeon. So long as this hybrid jumble of science and quackery comes daily before the public eye, it is useless to inveigh against mountebanks, and not to be wondered at, that a man when he is taken sick, should doubt whether to send for some specific, or a physician. We expect soon to see some journal which shall be devoted to science, surgery, quack specifics and the fine arts; and until such publication shall appear we think surgeons who do not wish to incur an empirical reputation, would do well to confine themselves to the pages of a medical journal, and all apothecaries, who desire the patronage of physicians, would be wise to discontinue the advertisement and sale of quack specifics. The small capital required to establish an apothecary shop, and the large advance on the sale of medicine in small quantities, offers an inducement for a great many disqualified individuals to embark in the business. The profit arising from the sale of drugs, is no more than a fair compensation to those who have spent previous years of hard labor, in making themselves chemists; but in the case of all such as become apothecaries out of mere thrift, the profit is unjustifiable and the pursuit itself criminal. Many of these worthies are in the habit of prescribing and administering extemporaneously, to a large number of the ignorant and credulous, who are incapable of distinguishing between them and the well educated physician. One of these *quasi* doctors who set up a drug store some time since, was called on by a old lady, to know if he could not give her some-

depth. These sores healed up in a few days by granulations from their bases. On the contrary, if we apply a weaker solution, (ten grains to the ounce,) to a blistered surface, it produces an acute burning pain, the true skin will afterwards be found inflamed, but no lesion will have taken place. With these facts before us, it would seem proper in all cases where a saturated solution has been swallowed, to give a quantity of water sufficient to dilute the solution contained in the stomach, to such an extent as to destroy its caustic action, which, if not instantly arrested, must render death inevitable. By adopting this course we should prevent the direct caustic effect of the solution, we have time to procure the antidote, which should be given in all cases so soon as it can be obtained, and in the after treatment we should have simple inflammation, instead of death, of the mucous coat of the stomach to contend with. We must recollect, however, that the mercurial solution is rendered more slow, but not less certain in its fatal effect, by dilution; no time is therefore to be lost in decomposing it. A gentleman, at one of our principal hotels, ordered a glass of cider, in the act of swallowing the first mouthful of which, he

thing for nettle rash, (urticaria.) The doctor examined the eruption very carefully, and came to the conclusion that cream of tartar was the remedy, and forthwith prepared the dose. The old lady was loath—instinctively, perhaps—to take any thing internally, and said she would prefer some external application: the doctor persisted, however, that he had hit on the proper remedy, and in order to overcome the objections of his patient, took half the dose himself, declaring, at the same time, that it was not unpleasant to the taste; which argument proved irresistible, and his patient swallowed the other half, and then took a seat, whether for the purpose of ascertaining before she left the shop that she had not taken poison, or from an indisposition to move, we cannot say. Meanwhile, the doctor, delighted at his prowess, related most eloquently other instances of his success, and doubtless thought this last act ominous of a brilliant reputation. He was interrupted, however, by violent sick stomach, which his patient began also to experience. Great consternation arose, and a medical gentleman was sent for, who found, on his arrival, that the modern *Æsculapius* had given, by mistake, tartar emetic instead of cream of tartar. The truth of this incredible performance is attested by the respectable medical witness who was sent for at the time. Wherein is the utility of laws prohi-

was warned by the burning taste of the fluid, that he taken something wrong; in a few minutes he was seized with the most violent, burning pain in the stomach, and along the line of the œsophagus. A physician was sent for, who found on his arrival, that a saturated solution of corrosive sublimate, in whiskey, had been taken instead of cider. Albumen was freely administered, in spite of which the symptoms grew more violent, and death ensued on the third day. The mistake originated in the heedlessness of a servant, who after using the corrosive solution for the purpose of cleansing bedsteads, had carried the bottle in which it was contained to the bar, and placed it on the shelf where the cider was kept. Now, in all cases similar to the one just stated, in which a solution of mercury was swallowed in a very concentrated state, it would be proper to administer, immediately, a draught of water sufficient to destroy its caustic properties, and then to give the antidote as soon as it can be obtained. We would

biting the practice of physic unless under the authority of a diploma, if the pretext of keeping an apothecary shop is always a ready means of evading them? The importance of having suitable persons appointed to inspect the drugs sold in our market is obvious; we have inspectors of flour and tobacco, of the excellence of which the dealer, as well as the consumer, is a fair judge, and yet medicines, the character of which none but a good chemist can determine, are permitted to pass from hand to hand, and to be given in the conflict between life and death, without any security that they are calculated to meet the indication for which they are used, or their having come under the eye of any one competent to judge of their qualities. The fact is notorious, that large sums are annually made by the manufacture of adulterated chemicals, and it is equally well known to the profession, that two-thirds of the medicine sold in our drug stores is utterly worthless: without some system of inspection, our city will become the vortex for drugs which have been rejected in other markets. The merest culler and vender of simples is permitted to keep and sell the most deadly poisons, and is consequently, at all times, the ready accomplice of any caitiff wretch who may choose to procure them with criminal intent. In a notorious case of trial for homicide, by poisoning, which came before our criminal court a few years since, it was impossible to ascertain from whence the poison had been procured.

recommend the proposed antidote to be kept by the apothecary in papers, containing each,

Finely divided gold,

iron, à à-℥ii.

Gum acacia, 3ss. M.

These powders should be kept free from dampness, in order to prevent the oxidation of the iron: in case of poisoning with any of the compounds of mercury, one of these powders is to be stirred into a tumbler of water and swallowed; if any of it should be rejected, another powder should be given. If a solution of mercury were swallowed, we could not expect much benefit to arise from the use of gold and iron in any other state than that of dust. We should not hesitate, however, in case of poisoning with the insoluble compounds of mercury, if the dust could not be obtained, to use these metals in the form of beads, fine chains, or any other shape in which they could be conveniently swallowed, for we believe they would decompose the soluble salt, with as much rapidity at least, as it could be formed in the stomach.

We have made these remarks for the purpose of inviting the attention of others to the subject; it is our intention, however, to renew and perfect the experiments already made.

Maryland Medical and Surgical Journal.

ART. XLVIII.—NATIONAL MEDICAL CONVENTION.

THE National Medical Convention for the revision of the Pharmacopœia of the United States, assembled in the City Hall, Washington, on the 1st day of January, 1840.

The following delegates represented their respective Medical Societies and Colleges in the Convention, viz. :

Rhode Island Medical Society—Theophilus C. Dunn, M. D.

New Jersey Medical Society—Lewis Condict, M. D.

The College of Physicians of Philadelphia—Franklin Bache, M. D., Henry Bond, M. D., Joseph, Carson, M. D.

University of Pennsylvania—Geo. B. Wood, M. D.

Jefferson Medical College—Robley Dunglison, M. D.

Delaware Medical Society—William B. Morris, M. D., James Couper, M. D.

Washington University, Baltimore—John R. W. Dunbar, M. D., John C. S. Monkur, M. D., Edward Foreman, M. D.

Medical and Chirurgical Faculty of Maryland—Joshua J. Cohen, M. D.

Medical Society of the District of Columbia—Thomas Sewall, M. D., N. W. Worthington, M. D.

Columbian Medical College—Thomas Miller, M. D., Harvey Lindsly, M. D., John W. Thomas, M. D.

Vincennes Medical Society of Indiana—John W. Davis, M. D.

Georgia Medical Society—William Bacon Stevens, M. D.

The credentials of the delegates from the White Mountains Medical Society of Vermont, from the Medical Society of New Hampshire, from the Albany Medical College, and from the College of Physicians and Surgeons of Lexington, Kentucky, were presented by Dr. Condict, President of the Convention of 1830 ; but the delegates were prevented from attending. After the rising of the Convention, however, Josiah Bartlett, M. D., delegate from the New Hampshire Medical

Society, and Samuel G. Baker, M. D., and William A. Aiken, M. D., delegates from the University of Maryland, reached Washington ; and, by public notice in the papers, stated their full concurrence in the measures adopted by the Convention.

The Convention elected Lewis Condict, M. D., of New Jersey, President ; George B. Wood, M. D., of Philadelphia, Vice President ; N. W. Worthington, M. D., of Georgetown, D. C., Secretary ; and Harvey Lindsly, M. D., of Washington, Assistant Secretary.

With the view of giving the various medical interests of the country their due weight in the deliberations of the Convention, the Surgeon General of the Army, and the Senior Naval Surgeon at Washington, were invited to participate in the proceedings.

After some other preliminary business, the Convention adopted the following resolution, offered by Dr. Bache :

Resolved, That the delegates from the different medical bodies represented in this Convention, be requested to present any written communications with which they may have been charged.

Upon calling over the several delegations, it appeared, that no written communication had been forwarded to the Convention, except by the College of Physicians of Philadelphia. Dr. Bache presented from this College several documents, which he stated had been prepared with great industry and care, with a view to facilitate the revision and emendation of the Pharmacopœia of 1830. This communication elicited discussion ; but with a view to more definite action, Dr. Lindsly proposed the following resolution, which was adopted.

Resolved, That the communication from the College of Physicians of Philadelphia be referred to a Committee, who shall also be instructed to report a plan by which the revision and publication of the Pharmacopœia may be carried into effect.

It was resolved that the Committee should consist of five members, to be named by the President ; and Drs. Bache, Davis, Stevens, Cohen, and Dunn, were appointed.

Dr. Wood offered the following proposition, which was adopted.

Resolved, That a Committee be appointed to report a plan for the organization of the next Convention for revising the Pharmacopœia.

It was ordered that the Committee consist of three members, to be named by the President ; and Drs. Wood, Sewall, and Dunglison, were appointed.

The Committee to whom the documents from the College of Physicians of Philadelphia were referred, and whose duty it was to arrange a plan by which the revision and publication of the Pharmacopœia might be carried into effect, made the following report, which, with the accompanying resolution, was adopted by the Convention :

“The Committee are of opinion, that the labors of revision, constituting the communication from the College of Physicians, would form a proper basis for the new Pharmacopœia ; and that this communication and all others that shall be received from bodies which have appointed delegates to this Convention, should be referred to a committee of revision and publication to meet in Philadelphia as soon as practicable. As it is desirable that the committee here proposed should have the assistance of pharmaceutical bodies, it is recommended that authority be given to it to request the co-operation of Colleges of Pharmacy in the United States. A revising Committee thus constituted, and clothed with power to fill their own vacancies, to publish the work after the completion of the revision, and to take order on all incidental measures necessary to carry out the objects of the Convention, would, in the opinion of this Committee, form a body, to which the revision and publication of the Pharmacopœia might be safely trusted. To carry out these views, the Committee recommend the adoption of the following resolutions by the Convention :

“1. The communication from the College of Physicians of Philadelphia, and all other communications which may be received from bodies that have appointed delegates to this

Convention, shall be referred to a Committee of revision and publication, consisting of seven members, three of whom shall form a quorum.'

"2. The Committee thus constituted, shall meet in Philadelphia, and be convened as soon as practicable by its chairman.

"3. The Committee shall be authorized to request the co-operation of the Colleges of Pharmacy in the United States, to publish the work after the completion of the revision, and to take all other measures which they may deem necessary to carry into effect the object of the Convention.

"4. The Committee shall have power to fill its own vacancies.

"5. When the Committee shall have terminated their labors, they shall prepare a report of their proceedings, and transmit it to the Secretary of this Convention, to be laid before the next Convention."

All which is respectfully submitted.

FRANKLIN BACHE,	}	Committee.
JNO. W. DAVIS,		
WM. BACON STEVENS,		
JOSHUA J. COHEN,		
THEOPHILUS C. DUNN,		

Washington, Jan. 3, 1840.

The Convention then proceeded to choose the members of the Committee of revision and publication proposed in the above report, and Drs. Wood, Bache, Dunglison, Cohen, Dunn, Stevens, and Sewall, were appointed.

The Committee whose duty it was to arrange a plan for the organization of the next Convention, for revising the Pharmacopœia, made a report, which, at the suggestion of Dr. Stevens, was amended, so as to make the first Monday in May, 1850, the time for the meeting of the Convention, instead of the first Monday in January, 1850. The report thus amended, and modified in other respects to suit the change, was adopted by the Convention as follows:

"The Committee appointed to suggest a plan for organizing the next Convention, report, that they have taken the subject into consideration, and ask leave to submit the following reso-

lutions, which, with a few modifications, are the same as those adopted in 1830, for the organization of the present Convention.

“ 1. The President of this Convention shall, on the first day of May, 1849, issue a notice, requesting the several incorporated State Medical Societies, the incorporated Medical Colleges, the incorporated Colleges of Physicians and Surgeons, and the incorporated Colleges of Pharmacy, throughout the United States, to elect a number of delegates, not exceeding three, to attend a general Convention to be held at Washington, on the first Monday in May, 1850.

“ 2. The several incorporated bodies thus addressed shall also be requested by the President to submit the Pharmacopœia to a careful revision, and to transmit the result of their labors, through their delegates, or through any other channel, to the next Convention.

“ 3. The several medical and pharmaceutical bodies shall be further requested to transmit to the President of this Convention the names and residences of their respective delegates as soon as they shall have been appointed, a list of whom shall be published, under his authority, for the information of the medical public, in the newspapers and medical journals, in the month of March, 1850.

“ 4. In the event of the death, resignation, or inability to act of the President of the Convention, these duties shall devolve on the Vice President; and should the Vice President also be prevented from serving, upon the Secretary, or the Assistant Secretary, the latter acting in the event of the inability of the former.”

GEORGE B. WOOD,	}	Committee.
THOS. SEWALL,		
ROBLEY DUNGLISON,		

Washington, January 3, 1840.

The following resolutions were offered by Dr. Wood, and adopted by the Convention:

Resolved, 1st, That the Secretary take charge of and preserve the existing records until his successor be appointed by

the Convention of 1850, when it shall be his duty to hand them over to such successor; 2d, that in case of the death, resignation, or inability to act of the Secretary, his duties shall devolve upon the Assistant Secretary; and, 3d, that it be recommended to future Conventions to appoint their Secretary and Assistant Secretary from members residing in the District of Columbia.

Dr. Bond offered the following resolution, which was adopted:

Resolved, That the Committee of revision and publication be requested to take such measures as they may deem most effective, to induce physicians and apothecaries to adopt the nomenclature of the Pharmacopœia in their prescriptions and labels.

Dr. Dunglison offered the following resolution:

Resolved, That the officers of this Convention be requested to prepare forthwith for publication, such part of the transactions of this Convention as may seem to them to be adapted for making extensively known its important objects and proceedings, and that they be authorized to publish the same in the various medical journals of the United States, and in such of the daily and other newspapers as they may think proper.

This resolution was adopted, and it was made the duty of the Secretary and Assistant Secretary to carry it into effect.

Having transacted business of great interest to the medical profession of their country,—having passed votes of thanks to the officers of the Convention “for the able and dignified manner in which they had discharged their respective duties,” and to the Board of Aldermen of Washington for the use of their Hall,—the Convention, after a session of three days, characterized by a spirit of generous cordiality, which must contribute greatly to secure the objects for which they assembled, adjourned.

By order,

N. W. WORTHINGTON, Secretary.

HARVEY LINDSLY, Ass't Sec'ry.

P. S.—The medical journals throughout the United States are respectfully requested to copy the forgoing abstract of the proceedings of the Convention.

MISCELLANY.

On a new method of distinguishing Arsenic from Antimony, in cases of suspected poisoning by the former substance, by Mr. J. MARSH.—In testing for arsenic in cases of poisoning by that substance, it has always been desirable to render the process as simple as possible, and thereby divest the mind of any ambiguity on the subject. It was with this view, that I submitted to the Society of Arts, &c., in the year 1836, my process by hydrogen, a process that I then fondly hoped would have removed all difficulties; but a communication from my friend Mr. Lewis Thompson, and which was inserted in the London and Edinburgh Philosophical Magazine, vol. x, p. 353, has rendered the process, in some measure, more difficult than was at first supposed, by the discovery of that gentleman, of a compound in which antimony combines with hydrogen to form a gas (antimoniuretted hydrogen.) This gas gives off, by the process employed, metallic crusts, which much resemble, to the inexperienced eye, the metallic substance derived from arsenical solutions by the same arrangements. It becomes necessary, therefore, to find means of distinguishing these metallic crusts from each other. Many processes, which are well known to the experienced chemist, may be employed for this purpose; but the misfortune is, that all these arrangements suppose a previous chemical acquaintance with the subject; for instance, a good process is given for this purpose by Liebig and Mohr, in their valuable journal, (*Lieb. Ann.* xxiii, 217,) and also, a modification of the same by Berzelius may be seen copied in the *Lancet*, vol. i, 1838, p. 819, but these are all liable to the above objection, viz., a want of simplicity.

I am happy in being able to lay before your readers a very simple distinguishing test for these bodies, and which I have employed in all cases of doubt with perfect success. The means which I use are simply as follows: After the common arrangements have been made for testing for antimony or arsenic, the piece of glass or porcelain on which the metallic crusts are generally received, is to have a single drop of distilled water placed on it; the glass or porcelain is then to be inverted, so that the drop of water is suspended undermost. The gas, as it issues from the jet, is to be inflamed in the usual manner, but the piece of glass, &c., with its drop of water, is to be held about an inch above the jet, or just above the apex of the cone of the flame; the arsenic, by this arrangement, is oxidized

at the same time that the hydrogen is undergoing combustion, and coming in contact with the drop of water held above, forms with it a strong or weak solution of arsenical acid, according to the quantity of arsenic present, should that substance have been in the mixture submitted to examination. A very minute drop of Hume's test (the ammoniacal nitrate of silver) being now dropped on the solution so obtained, if arsenic be present, the well known characteristic lemon color produced by this test, when used for testing that substance, is immediately produced, namely, the insoluble arsenite of oxide of silver. Antimony, under these circumstances, from being insoluble, produces no change. I have found it useful, when much arsenic has been present in the matter submitted to examination, to use a cleanglass tube, six inches long, and about half an inch in diameter. I slightly moisten the interior of the tube with distilled water, not allowing the hands or fingers to come in contact with the water: the tube thus prepared, is to be held vertically over the apex of the jet of burning gas. By these means a strong solution of the substance is obtained, and which may be tested with perfect ease by Hume's test, or any other of the usual tests employed for arsenic, &c.

I hope that the foregoing process will be found to possess all the delicacy and precision necessary for distinguishing these two bodies from each other, and that it will be the means of removing every doubt from the minds of the experimentalists in future.—*Lond. and Edin. Phil. Journ.*

Cissampeline a new vegetable base, by A. WIGGERS.—M. WIGGERS has announced that he has found in the root of the *Cissampelos Pareira*, a vegetable base, which he obtained by boiling this root several times in water containing sulphuric acid; and mixing the brown decoction with carbonate of soda; there is thus, a precipitate of a grayish brown color produced, which is washed with, and re-dissolved in water, acidulated with sulphuric acid. This solution is treated with animal charcoal; the carbonate of soda then forms a slightly yellow precipitate, which is dried, pulverised, and treated with successive portions of ether. There is obtained a solution almost colorless, which, on distilling off the ether, abandons the cissampeline; to purify completely this substance, it is dissolved in weak acetic acid; and again precipitated carbonate of soda from this weak solution which is to be slightly heated; it is to be carefully washed and dried, M. Wiggers proposes to publish hereafter, the results of more complete researches upon this base.

It is known, that M. Feneulle, who has likewise been occupied with the study of the *Pareira brava*, has pointed out the existence of a yellow bitter principle, in which the active properties of this root appear to reside, Is not this yellow bitter principle the cissampeline in an impure state?

A. G. V.

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